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Kew. ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1908.

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M.O. Bot. Garden
1909

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Errata.

Page 17, under No. 453, **Passiflora Wilsoni**, *Hemsl.*, read ; species ex affinitate *P. cupiformis*, Mast. et *P. Henryi*, Hemsl. ; ab hac differt foliis arcuato-truncatis et floribus cymosis, ab illa foliis basi rotundatis lobis acuminatis et floribus majoribus glabris.

Page 35, line 22 from bottom, *for* ♂ *read* $\overset{\uparrow}{\underset{+}{\delta}}$.

Page 46, line 12 from bottom, *for* 1840 *read* 1848.

Page 82, line 10 from bottom, *for* Windsor *read* Frogmore.

Page 220, line 14 from top, *for* **tripyhlla** *read* **triphylla.**

Page 221, line 7 from bottom, *for* p. 178 *read* p. 174; line 6 from bottom, for *G. fulva* read *P. fulva.*

Page 229, line 17 from top, and lines 14, 7, and 5 from bottom, *for* Macfayden *read* Macfadyen.

Page 239, line 23 from top, *for* Long. 66·01 E. *read* Long. 166·01 E.

Page 240, line 20 from top, and p. 244, line 29 from top, for *littorosa* read *litorosa.*

Page 244, line 20 from top, for *Lyalli* read *Lyallii.*

Page 249, line 19 from top, *for* taken by *read* presented by.

Page 288, line 6 from top, *for* 11516 *read* 11561.

Page 298, line 4 from bottom, *for* 9,164 *read* 9614.

Page 310, line 8 from top, for *Thievlaviopsis* read *Thielaviopsis.*

Page 314, line 11 from top, *for* **Africana** *read* **africana.**

Page 409, line 14 from bottom, *for* 1895 *read* 1905.

Page 428, line 19 from top, for *S. maritima* read *Z. maritima.*

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 1.] [1908.

I.—FUNGI EXOTICI, VII.

G. Massee.

The Fungi enumerated and described in the following pages were all collected in the Singapore Botanic Gardens. The specimens were sent to Kew by Mr. H. N. Ridley, F.R.S., Director of the Gardens, together with very beautifully executed coloured drawings, which have been placed with the specimens in the Herbarium. The drawings were made by Mr. Charles George de Alwis, grandson of the Ceylon artist Mr. de Alwis, who figured the extensive series of Fungi collected by Thwaites in Ceylon.*

This well-preserved collection of specimens from Singapore, accompanied by such excellent figures, has afforded one of the few opportunities for dealing with fleshy exotic Fungi in a satisfactory manner. All the previously described species included in this list, with the exception of *Bolètus scaber*, Fries, have been recorded from Ceylon.

Tricholoma nudum, Pers., and *Boletus scaber*, Fries, are common species in Britain.

Lepiota licmophora, Berk. and Br., and *L. citriophylla*, Berk. and Br., first recorded from Ceylon, have been imported to this country, and are now not uncommon in hothouses at Kew and elsewhere.

The beautiful miniature earthstar, *Geaster papyraceus*, Berk. and Curt., is the eastern representative of the genus, having previously been recorded from Bonin Island, Hindustan, Ceylon and Japan.

Agaricaceae.

Amanita virginea, *Massee*. *Pileus* carnosus e convexo expansus, siccus, albidus, flocculoso-squamosus, centro squamoso-hirtus, 10–12 cm. latus. *Lamellae* confertae, latae, ventricosae, liberae,

* Berkeley and Broome in *Journ. Linn. Soc.* 1871, xi., p. 494.

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postice annulatim conjunctae, albidae. *Sporae* ellipsoideae, basi apiculatae, 7–8 × 4 μ. *Stipes* e farcto cavus, albidus, supra annulum levis, infra floccis squamosis dense obsitus, volvae circumscissae obliterataeque margine adpresso arcte vaginatus, annulo distante evanescente, 10–12 cm. longus, 2–2·5 cm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 87, I.

Distinguished amongst known species by being entirely white. The imperfectly formed annulus suggests that the present species occupies an intermediate position between the genera *Amanita* and *Amanitopsis*, the latter differing from the former only in the absence of an annulus.

Lepiota felina, *Pers.*
Ridley, No. 33.

Lepiota inebriata, *Berk. and Br.*
Ridley, No. 47.

Lepiota holospilota, *Berk. and Br.*
Ridley, No. 20.

Lepiota licmophora, *Berk. and Br.*
Ridley, No. 79.

Lepiota phlyctarodes, *Berk. and Br.*
Ridley, No. 61.

Lepiota euconiata, *Berk. and Br.*
Ridley, No. 41.

Lepiota citriophylla, *Berk. and Br.*
Ridley, No. 66.

Lepiota coniocephala, *Berk. and Br.*
Ridley, No. 44.

Tricholoma theiochroum, *Berk. and Br.*
Ridley, No. 68.

Tricholoma charisterum, *Berk. and Br.*
Ridley, No. 64.

Tricholoma nudum, *Pers.*
Ridley, No. 86.

Armillaria squamosa, *Massee.* *Pileus* carnosus, e convexo expansus depressusque, flocculoso-squamosus, demum glabrescens, cinnamomeus, 3–4 cm. latus. *Lamellae* latae, ventricosae, subdistantes, albidae, acie integra. *Sporae* ellipsoideae, hyalinae, basi oblique apiculatae, 7–8 × 4–5 μ. *Stipes* supra annulum albus, infra fusco-squamulosus, dein squamulis secedentibus, pallidus, farctus, 5–6 cm. longus, 4–5 mm. crassus; annulus superus, reflexus, amplus, margine fimbriatus.

SINGAPORE. On the ground. *Ridley* No. 61, I.

A distinct species remarkable for the seceding flocculose scales of the pileus, and the large, superior, pendulous ring. Allied to *Armillaria omnituens*, Berk.

Collybia acuminata, *Massee.* *Pileus* carnoso-membranaceus, e campanulato convexus, acutissime umbonatus, cinereus —umbo obscuriore, fibrilloso-virgatus, margine fimbriato-lacerus, aetate rimosus, 7–9 cm. latus. *Lamellae* confertae, postice rotundato-adnatae, albido-griseae. *Sporae* hyalinae, subglobosae, 6 × 5 μ. *Basidia* clavata, 25–30 × 7–8 μ. *Stipes* elongatus, mox cavus, fibrilloso-striatus, deorsum ventricosus, radicatus, pileo concolor, basi albo-tomentosus, 12–14 cm. longus.

SINGAPORE. On the ground. *Ridley.* No. 22 V.

A well-marked species, characterised by the prominent, very acute, dark umbo, and the ventricose stem. Allied to *Collybia fusipes*, Bull.

Mycena cuspidata, *Massee.* *Pileus* membranaceus, e conico-campanulato subexpansus, umbone valde prominente praeditus, margine mox fissus, longitudinaliter sulcatus, fibrillosus, stramineus, centro brunneus, siccus, 5–7 cm. latus. *Lamellae* confertissimae, strictae, adnexae, ex albo-incarnato-tinctae, acie dentatae. *Sporae* hyalinae, ellipsoideae, basi oblique apiculatae, 7–8 × 5 μ. *Stipes* solidus, aequalis vel basi attenuatus, glaber, pileo concolor, deorsum fuscescens, 9–12 cm. longus, circa 1 cm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 25, Y.

With the general aspect of *Mycena galericulata*, Fries, but differing in being a much larger species. The most pronounced features are the solid stem, and the very large, acute umbo.

Clitocybe laccata, *Pers.*

Ridley, Nos. 1, 37, 78.

Lentinus similis, *Berk.*

Ridley, No. 9.

Lactarius tricolor, *Massee.* *Pileus* carnosulus, e convexo depressus vel infundibuliformis, margine primitus involutus alboque pruinatus, zonatus, castaneus, 4–5 cm. latus. *Lamellae* confertissimae, angustae, ochraceae. *Sporae* globosae, spinulosae, hyalinae, 6–7 μ diam. *Stipes* farctus, sursum attenuatus, glaber, purpureus, 4–5 cm. longus, 1 cm. crassus. *Lac* ignotum.

SINGAPORE. On the ground. *Ridley*, No. 30, D.

Structurally the present species approaches to *Lactarius quietus*, Fries, but differs in having smaller spores, and in the tricoloured ornamentation—chestnut pileus, ochraceous gills and purple stem.

Hygrophorus conicus, *Fries.*

Ridley, No. 85.

Volvaria geaster, *Berk. & Br.*

Ridley, No. 23.

Entoloma iodnephes, *Berk. & Br.*

Ridley, No. 19.

Clitopilus flavidus, *Massee.* *Pileus* carnosus, e convexo umbilicatus vel infundibuliformis, margine undulatus vel lobatus, laevis, minute squamulosus, flavidus, 4–5 cm. latus. *Lamellae* subconfertae, plus minusve decurrentes, albo-incarnatae. *Sporae* ellipticae, laxe et minute asperulae, roseo-tinctae, 6–7 × 4–4·5 μ. *Basidia* clavata, 21–25 × 6–7 μ. *Stipes* farctus, subfibrillosus, basi incrassatus, lacunosus, pileo concolor, 3–4 cm. longus, 1 cm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 56, D.

Distinguished from the known species of *Clitopilus* by its yellowish, minutely squamulose pileus. Near to *Clitopilus orcellarius*, Ces., from Borneo.

Clitopilus curtipes, *Massee.* *Pileus* carnosulus, cyathiformis, margine involutus, saepe lobatus, striatus, glaber, umbrino-ochraceus, expallens, 4 cm. latus. *Lamellae* distantes, plus minusve decurrentes, antice latissimae, incarnatae. *Sporae* subglobosae, nodulosae, incarnatae, 6–7 μ diam. *Stipes* farctus, fibrillosus, deorsum arcte attenuatus, basi subincrassatus et albo-tomentosus, 2 cm. longus, versus apicem 4 mm. crassus, pileo subconcolor.

SINGAPORE. On the ground. *Ridley*, No. 9, I.

Readily distinguished amongst known species of *Clitopilus* by the dusky pileus and stem. The latter is short and strongly attenuated downwards.

Eccilia hyalodepas, *Berk. & Br.*

Ridley, No. 23.

Gomphidius roseus, *Massee.* *Pileus* carnosus, subgelatinosus, convexo-umbonatus, flocculosus, glabrescens, pallidus, roseo-marmoratus, 3–4 cm. latus. *Lamellae* decurrentes, subconfertae, crassae, poroso-anastomosantes, olivaceo-flavae. *Sporae* oblongae, olivaceo-flavae, 12–15 × 4–5 μ. *Stipes* solidus, sursum incrassatus, flocculosus, pallidus, hic inde roseo-tinctus, 3 cm. longus, sursum 0·5 cm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 57, E.

Readily distinguished from the half-dozen known species of *Gomphidius*, which are confined to Europe and the United States, by the pale-coloured pileus streaked or marbled with rose-colour, the pale stem attenuated downwards, and the elongated spores.

Inocybe longipes, *Massee.* *Pileus* carnosulus, hemispherico-expansus, umbrino-purpurascens, squamosus, siccus, 3–4 cm. latus. *Lamellae* confertae, adnato-adnexae, ventricosae, ex albo lilacinae, acie obsolete fimbriata. *Sporae* subglobosae, nodulosae, lilacino tinctae, 7–8 μ diam. *Stipe* ssursum attenuatus, subtiliter striatulus, apice pruinatus, albo-lilacinus, basi albidus et nudus, 7–8 cm. altus, 4 mm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 73, U.

Allied to *Inocybe lanuginosa*, Bull., but differing in the pale, elongated stem and lilac gills.

Stropharia peronata, *Massee.* *Pileus* carnosulus, e convexo planus, siccus squamulosus, umbrinus—versus centrum obscuriore, granulis minutis concoloribus dense obsitus, 3–4 cm. latus. *Lamellae* confertae, angustae, sinuato-adnexae, umbrinae dein purpurascentes, acie concolor integra. *Sporae* oblique-ellipsoideae, purpureo-brunneae, 7 × 5 μ. *Stipes* fistulosus, tenuis, sursum attenuatus, pileo concolor vel dilutior, velo albo peronatus subannulatusque, 10–12 cm. altus, 3–4 mm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 55, C.

A very distinct species, recognised at once by the white buskin-like veil sheathing the stem and terminating in the superior annulus. Allied to *Stropharia squamulosa*, Fries.

Stropharia umbonata, *Massee.* *Pileus* carnosulus, e convexo expansus, acute umbonatus, siccus fuscidulus, squamis parvis concoloribus dense vestitus, margine flexuosus, 3 cm. latus. *Lamellae* confertae, postice sinuato-adnexae, brunneae acie albo-pruinata et minute denticulata, 3–4 mm. latae. *Sporae* ellipsoideae, basi oblique apiculatae, brunneae, 6 × 4 μ. *Stipes* e medulloso farctus, cavus, cylindraceus, supra annulum pallide brunneus, infra pulchre et laxe squamulosus, albidus, annulus superus, amplus, interdum reflexus, 4–5 cm. longus, 4 mm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 36, J.

Characterised by the brown, scaly pileus, and by the stem being covered with whitish scales below the large, superior ring. Allied to *Stropharia squamulosa*, Fries.

Hypholoma elatum, *Massee.* *Pileus* carnosulus, e conico-campanulato expanso-umbonatus, brunneus—umbone pallidiore fibrillosus dein diffracto-squamulosus, margine infractus et saepe lobatus, 6–8 cm. latus. *Lamellae* confertae, ventricosae, sinuato-adnatae, umbrinae, acie subtiliter fimbriata. *Sporae* oblique ellipsoideae, umbrinae, 6 × 4 μ. *Stipes* solidus, subaequalis, undique fibrillosus, apiceque leviter furfuraceus, pileo concolor, 9–12 cm. longus, 1–5 cm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 83, E.

Remarkable in the genus *Hypholoma* for the distinct umbo and the elongated stem. There is also a total absence of the yellow and greenish colours so prevalent in the genus. Allied to *H. atrichum*, Berk.

POLYPORACEAE.

Boletus scaber, *Fries.*

Ridley, No. 69.

HYDNACEAE.

Calodon Ridleyi, *Massee.* *Pileus* suberosus, campanulatus, obtusus, e velutino glabrescens, in prima evolutione coelestinus, dein coeruleo-nigrescens, margine lilaceus, laciniatus, 3 cm. latus. *Aculei* subulati, nigro-fusci, apice expallentes. *Sporae* subglobosae, verrucosae, brunneae, 4–5 μ diam. *Stipes* solidus, centralis subaequalis, tomentosus, mox glabrescens, pileo concolor, 3–4 cm. longus, 5–7 mm. crassus.

SINGAPORE. On the ground. *Ridley*, No. 72, T.

A very distinct and well-marked species. When quite mature every part is blackish with a suggestion of blue. When younger the blue tint is more distinct, and the growing margin violet or lilac. Not approaching any described species in form, structure and colour.

LYCOPERDACEAE.

Geaster papyraceus, *Berk & Curt.*

Ridley, No. 23, W.

On wood, springing from a dense, compact mass of white mycelium.

Lycoperdon rubicula, *Berk & Br.*

Ridley, No. 52.

GEOGLOSSACEAE.

Geoglossum spathulatum, *Massee.* *Ascomata* spathulata arcte compressa, distincta, farcta, nigra, pilosella, 1–1·5 cm. longa, 2–3 mm. crassa. *Stipes* subaequalis, e medulloso farctus, mox cavus dein subcompressus, velutinus, concolor, 3–4 cm. longus, circa 2 mm. crassus. *Asci* cylindraceo - subclavati, 8–spori, 80–90 × 9–10 μ, iodio haud tincti. *Sporae* cylindrico-clavatae, dilute brunneae, multi-septatae, utrinque acutae, 65–70 × 5–6 μ. *Paraphyses* filiformes, septatae, capitatae, sursum brunneo-tinctae.

SINGAPORE. On the ground. *Ridley.*

Most closely allied to *Geoglossum glabrum*, Pers., differing in the very much compressed, slightly pilose ascophore, and the longer, multiseptate spores.

II.—THE FRUIT FLY.

(*Ceratitis capitata*, Wied.)

For many years past the Fruit or Orange Fly, *Ceratitis capitata*, Wied., has seriously damaged the fruit crops in Western Australia, South Africa, St. Helena, Bermuda, and other countries. As long ago as 1896 a communication was received from the Acting Governor of St. Helena referring to the destruction of peaches in the island by fly, and, from the specimens sent at the time, W.F.H. Blandford, F.E.S., determined the insect as *Ceratitis capitata*, the well-known Orange Fly of Malta and elsewhere. In his report, which was sent to St. Helena, an interesting account of the distribution of the fly is given, together with suggestions as to the best means for its destruction. Whether these suggestions were given a fair trial does not appear. The pest, however, does not appear to have been in any way overcome, for in 1904 a letter was received from the Govornor of St. Helena stating that "for the last 22 years the fruit in this colony has suffered severely from the ravages of a fly." This pest was supposed to have been intro-

duced into St. Helena from the Cape in a shipment of grapes. Legislation was proposed with a view of exterminating the fly, but if carried out, does not appear to have had beneficial results.

Frequent references to the destruction caused by *Ceratitis capitata* are to be met with in the agricultural journals of the Cape of Good Hope, Western Australia, Tasmania, New Zealand, and other countries, where it is referred to under the names of Mediterranean, Peach or Orange Fly.

Another pest of similar habits, *Tephritis Tyroni*, occurs in Queensland, where it attacks the orange trees, but as it appears to be confined to tropical countries it has not the wide range, and does not cause damage to the same extent as the *Ceratitis*.

The occurrence of the "Mediterranean fly" (*Ceratitis*) in so many widely separated localities appears to be due to its introduction in infected fruit whence it has spread far and wide; it is thought that its introduction into the Cape was by means of fruit from Madeira, and it appears to have reached Tasmania from Sydney. Considerable doubt exists as to the native home of the insect; it has been found in Brazil by Mr. George Compere, where it is kept in check by a predatory beetle, and this points to the possibility that Brazil may be the original home of the species.

This discovery by Mr. Compere leads up to the question as to how the parasite can be kept down or destroyed. The problem has been attacked in several ways. On the one hand repeated attempts have been made to find some substance which will serve both as an attraction and as a poison to the flies, and this has been coupled with the destruction by burning, boiling, or deep burying of all infected fruit to kill the pest in the larval or maggot stage. Then, particularly in the Cape districts, netting of the trees has been resorted to, which, though troublesome and costly, appears to have been highly successful for "bush" trees. This method, could it be adopted for all trees, would of course bring about the extermination of the pest, the fruit being an essential factor in the life history of the fly, inasmuch as the propagation of the species is dependent on fresh broods of flies from eggs laid in the fruits. In this connection it may be noted that the orange offers considerable difficulties in the way of the extermination of the fly owing to the long period of time which elapses between the ripening of the earliest and latest fruits of the crop. Furthermore, the constant succession of different fruits such as apple, apricot, fig, kei apple, lemon, orange, passion flower, peach, pear, plum, &c., affords a continuous series of hosts in which the flies can lay their eggs.

An interesting experiment to bring about the destruction of the fly by natural agencies is due to Mr. Compere, who discovered and collected the parasite of the fruit fly in Brazil. The beetle *Hexamerocera brasiliensis*, one of the *Staphylinidae*, is predaceous on the larvæ of the fruit fly, and it is hoped that its introduction into Western Australia will lead to the extermination of the fly. Investigations as to this parasite have also been carried out by the Cape Government Entomologist, but though all these matters are as yet only in the experimental stage it does not appear likely that any great measure of success will result from the introduction of

this beetle. It is of interest to point out that a similar mode of attack—by means of an internal parasite—has been tried against the olive fly *Dacus oleae*, Rossi, in Italy without very encouraging results.

Artificial means therefore appear to offer the only safe way of combating the pest, and numerous forms of poisonous solutions have been tried.

In Western Australia cyanide of potassium or arsenic with orange juice was placed in saucers about the fruit trees, but neither of the poisons appeared to be efficient either in attracting or poisoning the flies (v. *Journal of Agriculture, Western Australia*, Vol. 10, 1904, p. 27). In the following year a report of further experiments is given in the same Journal (Vol. 11, p. 115), in which McDougall's insecticide tree wash was used for spraying orange trees with very satisfactory results. The trees were sprayed four times, about once a month, and the mixture used was 1½ gallons of wash to 40 gallons of cold water. The cost of this treatment was moderate and no injury resulted to the fruit from its employment. It appears, however, that the pest in the case of this experiment was the Queensland fly *Tephritis Tyroni*. Another mixture to be used for spraying is suggested by Mally in the *Cape Agricultural Journal*, Vol xxv., 1904, p. 660, and consists of 1 lb. arsenate of lead, 25 gallons of water, and 5 gallons of treacle. The results from this mixture have been encouraging, and it is of interest to note that Professor Berlese in Italy has evolved a somewhat similar compound for the destruction of the olive fly, which may also prove of value against the *Ceratitis*. The solution is as follows: honey, 31 per cent.; molasses, 65 per cent.; glycerine, 2 per cent.; arsenite of potash, 2 per cent. When required for use the mixture, which can be stored indefinitely, must be dissolved at the rate of 10 parts of the mixture to 90 parts of water.

This mixture would be more expensive than that suggested by Mally and it is thought that the arsenite of potash might scorch the trees, but owing to the success which has attended Professor Berlese's experiments in Italy it would seem that this solution should be given a fair trial. An account of the method will be found in the *Cape Agricultural Journal*, Vol. xxx., 1907, p. 193.

By far the most efficient and useful destructive agent against the Fruit Fly has quite recently been brought to our notice by the Secretary of State for the Colonies, who has forwarded to Kew the following correspondence between the Governor of St. Helena and the Government Entomologist of Tasmania.

The GOVERNOR of ST. HELENA to the HIGH COMMISSIONER for SOUTH AFRICA.

The Castle, St. Helena,
August 26th, 1907.

MY LORD,

I HAVE the honour to transmit herewith for your Lordship's information copy of a communication lately received by this Government from the Government Entomologist of Tasmania

on the subject of the destruction of the fruit pest known as the peach-fly. As this fly exists in some parts of South Africa, and was in fact imported into St. Helena in a crate of grapes from South Africa 25 years ago, your Lordship may consider the information given in the enclosure as worthy of circulation in the South African Colonies.

I have not yet been able to apply the kerosene remedy in this Colony as the peach-fly does not commence active operations before October or November.

I have, &c.,
(Signed) H. L. GALLWEY.

Right Honourable
The Earl of Selborne, G.C.M.G.,
High Commissioner for South Africa,
Johannesburg, Transvaal.

GOVERNMENT ENTOMOLOGIST, TASMANIA, to SECRETARY, DEPARTMENT of AGRICULTURE, ST. HELENA.

Department of Agriculture,
Hobart, Tasmania,
May 24th, 1907.

DEAR SIR,

SOME time ago a communication from St. Helena as to the extermination of the fruit fly was forwarded to me, and in reply I stated that probably the only chance you would have of exterminating that pest would be by gathering and destroying the whole of your fruit for one season.

Since then a most remarkable discovery was accidently made in Western Australia, where it was found that pure kerosene attracted the flies. This discovery has since been confirmed in New South Wales and Victoria, so that it is probable that the fruit fly (*Halterophora*, or *Ceratitis capitata*) will be attracted by kerosene wherever it occurs. I send you a copy of part of an article from the Journal of the Department of Agriculture of Western Australia (April, 1907, page 245) being so far as I am aware the only official report of its use, although newspaper reports have been plentiful, and I have had several letters from various entomologists confirming it.

I am, &c.,
(Signed) ARTHUR M. LEA.

(Enclosure.)

"Recently Mr. Davenish of Guildford discovered the fact that pure kerosene oil, when placed in an orchard or garden where the fruit fly (*Ceratitis capitata*) existed, attracted that fly; and by placing a shallow vessel containing some kerosene in amongst the branches of the trees the flies would be destroyed by hundreds. Mr. H. E. B. Gull, also of Guildford, carried out, simultaneously with Mr. Devenish, promising experiments with kerosene."

"Since my return to the State, in company with Mr. Newman, we made some experiments with the kerosene in some close by

gardens, with a view to ascertain if the flies were in reality attracted by the kerosene oil, or if their getting into it was purely accidental. Our experiment showed that there is nothing accidental in connection with their getting into the oil, but showed most clearly that the kerosene really attracted the flies. A vessel containing some kerosene was placed in the forks of a tree about 18 inches above the ground, and at a point where ordinary specimens of the flies are never noticed. Within 15 minutes after having placed the vessel in the position above mentioned dozens of flies could be noticed moving about the trunk of the tree making their way to the oil; and 18 hours later Mr. Newman removed and counted 124 fruit flies from the one vessel. Female flies removed from the oil showed upon examination to be fertile, being yet full of eggs."

In the article from which the above quotation is made, a figure is given of a self-feeding tin for the capture of the fly. It should be noted that the tins must be shallow, such as lids of cocoa tins, &c., and it is found in practice that they are most effective when half full, and inclined at a slight angle. It is reported in the September number of the *Journal of Agriculture, Western Australia*, 1907, that no less than 1,268 flies were destroyed by kerosene in 24 hours; whilst in another orchard, where no flies could be seen, and only a few maggoty fruits had been found, the kerosene caught a single pair of flies. Since the kerosene only kills the adult flies, it will still be necessary to collect daily and boil or burn all the fallen infected fruit, and so kill as many of the maggots as possible. With these two methods of attack, which are being enforced in Western Australia, it seems likely that the fruit-fly pest may be held in check.

Yet another weapon against the fruit-fly is recorded in the same journal for October, 1907, namely, "Cold storage" of the newly punctured fruit. It has been stated that if the newly punctured fruit be stored in the refrigerator, the larvae are killed before they can do any damage to the fruit, and also that the fruit itself ripens nearly as well in the ice chamber as it would have done on its native branch in the sunshine.

As regards kerosene, it appears to be attractive to the flies only in dry weather, for, with a moist atmosphere, the kerosene traps are not visited, and the oranges (in this case) continued to be attacked.

Cold storage then appears to confer two benefits, for not only is the insect pest destroyed, but also the grower is able to keep back his fruit, so as to sell it in a better market.

In Bermuda, where the *Ceratitis* has come under special legislation ("The Fruit-fly Destruction Act, 1907"), it is of interest to note from the report published in *The Bermuda Colonist* of August 12th, 1907, that good results have attended the work carried out under the directions of the Act. The methods employed have been destruction of infected fruit and pruning of trees to prevent the bearing of fruit, which would serve for the reception of the fly's eggs. So that, whilst at the time of writing, they had very few flies, they were also almost destitute of fruit. If the preventive measures which appear to

have been so thoroughly carried out in Bermuda are supplemented by the use of kerosene, there would seem to be every prospect of the pest being exterminated from the island.

In conclusion, a note of warning is needed nearer home. As long ago as 1900 M. Alfred Giard announced the presence of *Ceratitis capitata* in the neighbourhood of Paris (*Comptes rendus*, t. cxxxi., 1900, p. 436). The insect, at first very scarce, restricted its attacks to the apricots, and no attempt appears to have been made to destroy the pest although sound advice was given.

In a further communication (*Comptes rendus*, t. cxliii., 1906, p. 353) M. Giard states that the ravages of the insect have greatly increased, and that the peaches are now seriously attacked in various localities around Paris. He is of the opinion that, with a series of dry summers, the pest will be as disastrous to the fruit growers around Paris as it is at the Cape unless systematic preventive measures are adopted.

Compere, G. Journ. Agric. West. Australia. 10, 1904, pp. 68–72.
Gives an account of the introduction of the Fruit-fly parasite.

Compere, G. Journ. Agric. West. Australia. 12, 1905, p. 6.

Mally, C. W. Agric. Journ., Cape of Good Hope. XXV., 1905, pp. 647–661, with plate.
A detailed account of the life history of *Ceratitis capitata*, and proposed methods of destruction, &c., and prevention of attack.

Jefferson, J. S. Journ. Agric. West. Australia. 15, 1907, pp. 161–166.
A short account of the Fruit-fly, with the results of using the "Fruit-fly Exterminator," the composition of which is not stated.

Compere, G. Journ. Agric. West. Australia. 15, 1907, pp. 244–245, with plate.
Kerosene remedy and the Fruit-fly.

Hooper, T. Journ. Agric. West. Australia. 15, 1907, pp. 696-697.
Fruit-fly : Instructions to growers.

Hooper, T. Journ. Agric. West. Australia. 15, 1907, pp. 772-774.
Fruit-growing industry.

III.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECADES XLV–XLVI.

441. **Durandea angustifolia**, *Stapf* [Linaceae]; quoad folia *D. orcogenae*, Stapf (*Hugoniae oreogenae*, Schlecht.) similis, sed foliis angustioribus minus conspicue dentatis et floribus in racemos axillares dispositis distincta.

Frutex glaberrimus, ramis cortice pallido fere ochraceo obtectis, gemmis minutis. *Folia* anguste oblanceolata, basi longe attenuata, crenulato-dentata, 8–14 cm. longa, 1·4–1·8 cm. lata, coriacea, exsiccando fuscescentia, nervis lateralibus utrinque 12–14, uti venis pulchre reticulantibus utrinque prominulis; petioli graciles, 8–14 mm. longi. *Racemi* angusti, axillares, 1–2·5 cm. longi, 5–7 mm. lati; bracteae minutae; pedicelli 1–2 mm. longi. *Sepala* rotundato-ovata, 2 mm. longa, minutissime papilloso-ciliolatae. *Petala* elliptico-oblonga, 3–4 mm. longa, basi vix incrassata nec pilosa, superne minutissime ciliolata. *Filamenta* basi in annulum coalita, glaberrima. *Styli* 5, tenues, ovario aequilongi, in alabastro stamina paulo superantes.

SOUTHERN NEW CALEDONIA. Port Boisé, *Vieillard*, 2336.

Since my synopsis of *Durandea* was drawn up for *Hooker's Icones Plantarum* (see under tab. 3822), I have had, through the courtesy of Professor Lignier of the University at Caen, an opportunity of seeing some further material of that genus. Among it there was the new species described above, a specimen of *D. Lenormandii*, like the one quoted by me *l.c.* p. 2, from Wagap, but numbered '934,' and one, also numbered '934,' of *D. serrata* (*Penicillanthemum neo-caledonicum*, Vieill.). There can, however, be no doubt that Vieillard intended the latter when describing his *P. neo-caledonicum*. In connection with this I may remark that the Kew specimen of Vieillard's No. 934, which I quoted in my synopsis under *D. serrata* consists of two branches, one (*a*) a counterpart of Labillardière's plant, the original of Planchon's *D. serrata*, the other (*b*) absolutely agreeing with the *Penicillanthemum neo-caledonicum* No. 934, of the Caen herbarium. The differences between *a* and *b*, are in the branches of *a* being paler and more lenticellate, in the more olive-brown colour of the underside of the leaves in *a* against the almost chocolate-brown colour in *b*, and in the more attenuate leaf-bases of *a*. There is no difference in the flowers of Labillardière's specimen and of Vieillard's plant. I must, however, add that the former are only represented by fairly mature buds.

D. oreogena was by an oversight omitted in my synopsis of the genus in *Hooker's Icones Plantarum*. It has to be inserted after *D. racemosa*, with the synonym *Hugonia oreogena*, Schlecht. in Engl. Jahrb. vol. xxxix. p. 137, fig. 9 on p. 138, and the following localities :—South-east New Caledonia; slopes of Mt. Humboldt, 1300 m., *Schlechter*, 15350 : North-east New Caledonia, hills near Oubatche, 1000 m., *Schlechter*, 15500.

442. **Durandea Lenormandii**, *Stapf* in Hook. Ic. Pl. sub t. 2822 (descr. ampl.) [Linaceae]; a *D. serrata* differt foliis angustioribus plerumque acutis inflorescentiis glaberrimis, sepalis petalisque (in alabastris quidem) ciliatis.

Frutex glaberrimus, ramis multi-lenticellatis. *Folia* lanceolata vel lanceolato-oblonga, acuta vel subacuminata, raro obtusa, basi cuneato-attenuata, 6–10 cm. longa, 0·8–0·3 cm. lata, coriacea, exsiccando fuscescentia, leviter crenulato-serrata, nervis lateralibus utrinque circiter 13, uti venis reticulantibus utrinque prominulis; petioli 6–10 mm. longi. *Paniculae* angustae, 5–6 cm. longae, 1·6 cm. latae, axillares et terminales, ramis ad 1·6 cm. longis

majoribus 3–4-floribus ; bracteae minutae, a basi latiore subulatae ; pedicelli raro ad 2 mm. longi. *Sepala* 3·5–4 mm. longa, albo-ciliata. *Petala* obovato-cuneata, 7 mm. longa, glaberrima, ungue crassiusculo. *Filamenta* glaberrima, tubo 2 mm. longo. *Styli* 5, stamina superantes.

Eastern New Caledonia. On the highest mountains near Wagap, *Vieillard*, 2224 ; 934 in part.

443. **Durandea Deplanchei**, *Stapf* in Hook. Ic. Pl. sub t. 2822 (descr. ampl.) [Linaceae] ; a *D. racemosa* quacum petalis filamentisque basi pilosis congruit, inflorescentia multo graciliore longiore floribus minoribus differt.

Frutex glaberrimus (petalis filamentisque exceptis), ramis crassis cortice brunneo obtectis, gemmis axillaribus resina copiosa indutis. *Folia* oblanceolata, basi longe cuneatim attenuata, crenulato-serrata, 7·5–15 cm. longa, 2·5–5 cm. lata, coriacea, exsiccando fuscescentia, nervis lateralibus utrinque circiter 12–14, uti venis pulchre reticulantibus utrinque prominulis ; petioli 8–20 mm. longi. *Paniculae* angustae, 6–15 cm. longae, 2·5–3 cm. poll. latae, ramis ad 2·5 cm. longis iterum partitis ramulis paucifloris ; bracteae minutae ; pedicelli graciles, 2–3 mm. longi. *Sepala* 2 mm. longa, explanata multo latiora, minutissime papilloso-ciliolata. *Petala* obovato-cuneata, 6 mm. longa, ungue incrassato piloso (vix villoso). *Filamenta* ima basi tantum coalita, inferne parce pilosa, majora 5 mm. longa. *Styli* 5, tenues, staminibus multo breviores.

Eastern New Caledonia. Near Canala, *Deplanche*.

444. **Durandea viscosa**, *Stapf* in Hook. Ic. Pl. sub t. 2822 (descr. ampl.) [Linaceae] ; a *D. Deplanchei* affini differt foliis longe petiolatis latioribus tenuioribus grossius crenato-serratis.

Frutex glaberrimus (petalis filamentisque exceptis), ramis crassis cortice brumeo obtectis, gemmis resina copiosa indutis. *Folia* elliptico-oblonga, obtusa (?), basi attenuata, crenato-serrata, circiter 40 cm. longa, 7·5–9 cm. lata, tenuiter coriacea, nervis lateralibus utrinque circiter 12, uti venis pulchre reticulantibus utrinque prominulis ; petiolus 5 cm. longus. *Paniculae* angustae, ad 40 cm. longae, ad 3·6 cm. latae, totae resinoso-viscosae, ramis ad 2·5 cm. longis plerumque iterum divisis, ramulis paucifloris ; bracteae minutae ; pedicelli graciles, ad 6 mm. longi. *Sepala* ad 3 mm. longa, albo-ciliata. *Petala* obovata, breviter unguiculata, 5–6 mm. longa, intus supra basin albo-villosa. *Filamenta* inferne intus pilosa, longiora, 5 mm. longa, tubo 1 mm. longo. *Styli* 5, staminibus multo breviores.

Eastern New Caledonia. On hills near Canala, *Vieillard*, 2339.

445. **Durandea vitiensis**, *Stapf* in Hook. Ic. Pl. sub t. 2822 (descr. ampl.) [Linaceae] ; a *D. Jenkinsii* differt foliis minus coriaceis, inflorescentiis gracilioribus, stylis antheras multo superantibus.

Frutex scandens glaberrimus, ramis junioribus angulatis sulcatis exsiccando nigricantibus, vetustioribus cortice pallido obtectis gracilibus, uncis geminatis ad apices ramorum inflorescentias

substituentium quasi pedunculo 9–10 cm. longo suffultis. *Folia* oblonga vel oblongo-elliptica, acuta vel subacuminata, raro obtusa, basi acuta, obscure crenulato-serrata, 7·5–15 cm. longa, 3·5–5 cm. lata, chartacea, exsiccando fuscescentia, nervis lateralibus utrinque circiter 10 uti venis anastomosantibus utrinque prominulis; petiolus 4–12 mm. longus. *Paniculae* angustae, graciles, ad 12 cm. longae, 2·5 cm. (vel terminalis ad 5 cm.) longae, superiores approximatae, ramis simplicibus (paniculae ad racemos reductae) vel iterum divisis, ramulis paucifloribus; pedunculus ad 2·5 cm. et ultra longus; bracteae foliola saepe petiolata 6–8 mm. longa vel in panicula terminali majora referentes; pedicelli graciles, ad 8 mm. longi. *Sepala* 3–3·5 mm. longa, parce albo-ciliolata. *Petala* obovato-oblonga, cuneato-unguiculata, 10 mm. longa, glaberrima, aurea, ungue paulo incrassato. *Filamenta* glaberrima, majora, 4 mm. longa, tubo 1 mm. longo. *Styli* 5, stamina longe superantes, 5 mm. longi.

FIJI. Without precise locality, *Storck*, 4.

446. **Durandea parviflora**, *Stapf* in Hook. Ic. Pl. sub t. 2822 (descr. ampl.) [Linaceae]; affinis *D. vitiensi* sed partibus junioribus minute puberulis, paniculis ovoideis multo latioribus et floribus minoribus differt.

Frutex scandens, inflorescentiis exceptis glaberrimus, ramis junioribus sulcatis gracilibus exsiccando fuscescentibus, uncis geminatis versus apices ramorum aliquorum florigerum circiter ad 10 cm. nudorum indutus. *Folia* elliptico-lanceolata vel oblongo-elliptica, acuta vel acuminata, basi acuta, obscure crenulato-serrata, 7·5–12 cm. longa, 3–5 cm. lata, tenuiter coriacea, exsiccando fuscescentia, subtus pallidiora, nervis lateralibus utrinque 8–10, uti venis reticulatim anastomosantibus utrinque prominulis; petiolus gracilis, 4–8 mm. longus. *Paniculae* ovoideae, pedunculo ad 6 cm. longo suffultae, ad 7·5 cm. longae, ad 5–7·5 cm. latae, sparse minuteque puberulae, ramis inferioribus ad 5 cm. longis ad $\frac{2}{3}$ nudis, ramulis iterum divisis fere corymbulum formantibus, superioribus multo brevioribus racemose paucifloris; bracteae axis primariae inferiores vel omnes foliola parva referentes, ramorum subulatae, 3 mm. longae; pedicelli ad 3 mm. longi. *Sepala* 2 mm. longa, vix ciliolata. *Petala* anguste obovato-cuneata, ad 5 mm. longa, glaberrima, unguibus incrassatis. *Filamenta* glaberrima vel interdum pilis perpaucis basin versus conspersa, majora paulo ultra 2 mm. longa tubo brevissimo. *Styli* 5, graciles, 3 mm. longi.

SOLOMON ISLANDS. Probably New Georgia, *Officers of H.M.S. Penguin*.

447. **Sageretia Henryi**, *J. R. Drumm. et Sprague* [Rhamnaceae]; habitu similis *S. hamosae*, Brongn., a qua foliis minoribus, nervis lateralibus pro rata paucioribus, rhachi inflorescentiae glabriuscula et floribus pedicellatis recedit.

Frutex alte scandens. *Internodia* longiora 2–5 cm. longa, brevioribus alternata. *Folia* oblongo-lanceolata vel lanceolata, acuminata, acumine 1–2 cm. longo, 5–10 cm. longa, 2–3·5 cm. lata, inferiora elliptico-ovata minora, supra nitidula exsiccando subcastanea crebre reticulata, subtus opaca viridula, nervis supra leviter impressis, subtus prominentibus; petioli 5–10 mm. longi. *Stipulae*

subulatae 1–1·5 mm. longae. *Thyrsi* simplices, stricti, 3–7 cm. longi, in axillis superioribus geminati, rarius solitarii, rhachi minute puberula ; cymulae sessiles, 1–5-florae, 3-10 mm. inter se distantes ; pedicelli 1·5–2 mm. longi. *Calycis lobi* ovato-deltoidei, 1·5 mm. longi, basi 1·3–1·5 mm. lati. *Petala* alba (fide *Henry*), 1 mm. longa, anthesi perfecta quam stamina paullo breviora. *Stamina* calycis lobis breviora. *Ovarium* depresse trigono-globosum, 3-loculare. *Drupae* immaturae obovoideae, 5 mm. longae, rubrae (fide *Henry*), pyrenas 3 includentes, quarum 1 minore abortiva.

China. Yunnan ; Mengtze, on a wooded cliff, at about 1,600 m., *Henry*, 11240. Szechuan ; N. Wushan, *Henry*, 7118 ; Mount Omi, 1,200 m., *Faber*, 143. Hupeh ; *Henry*, 5340.

448. **Sageretia gracilis**, *J. R. Drumm. et Sprague* [Rhamnaceae]; affinis *S. parviflorae*, G. Don, a qua floribus majoribus magis aggregatis, sepalis pro rata angustioribus, foliorum venatione recedit ; ab *S. oppositifolia*, Brongn., olim ab auctoribus cum *S. parviflora* confusa, panicula ampliore glabriuscula ramis elongatis gracilibus facile distinguitur.

Frutex vagans vel scandens. *Internodia* longiora 1–5 cm. longa. *Folia* ovata usque lanceolata, saepius breviter acuminata, obtusa vel acuta, nervo medio in apiculum excurrente, basi obtusa vel rotundata, 4–7 cm. longa, 2–3 cm. lata, supra nitidula exsiccando intense viridia vel subfusca, crebre reticulata, subtus opaca, nervis supra leviter impressis subtus prominentibus ; petioli 5–7 mm. longi. *Stipulae* subulatae, 1–2 mm. longae. *Panicula* terminalis, floribunda, 15–30 cm. longa, rhachi superne necnon rhachillis minute pubescentibus ; rami primarii patentes 4–12 cm. longi, inferiores foliis vel bracteis foliaceis gradatim minoribus suffultae, ramos secundarios patulos 1–4 in parti inferiore gerentes, superiores bracteis stipuliformibus suffultae ; cymulae sessiles, 1–5-florae, 2–6 mm. inter se distantes, floribus sessilibus. *Calycis lobi* ovati vel triangulari-ovati, 1·3–1·5 mm. longi, basi circiter 0·8 mm. lati. *Petala* alba (fide *Henry*), circiter 0·8 mm. longa, quam stamina breviora. *Stamina* calycis lobis breviora ; antherae apiculatae. *Ovarium* 2–3-loculare. *Drupae* rubrae (fide *Henry*), 6–7 mm. longae, pyrenis 2 vel 3, quarum 1 minore abortiva, oblique obcordatis 5–6 mm. longis, 4·5 mm. latis.

China. Yunnan ; Mengtze, in woods, 1400–1600 m., *Henry*, 10144 (flower), 10144 A (fruit).

449. **Sageretia compacta**, *J. R. Drumm. et Sprague* [Rhamnaceae]; peraffinis *S. gracili*, nob., a qua foliis anguste lanceolatis, panicula coarctata pluries minore, floribus versus apices ramulorum compactis, staminibus sepala aequantibus differt.

Internodia longiora 0·6–1·5 cm. longa. *Folia* anguste lanceolata, acuta, vel obtusa et apiculata, basi obtusa vel rotundata, 4–7·5 cm. longa, 1·7–2·4 cm. lata, supra nitidula exsiccando subcastanea crebre reticulata, subtus viridula reticulatione manifesta nervis lateralibus prominulis, nervo medio supra leviter impresso subtus prominente ; petioli 4–7 mm. longi, *Stipulae* subulatae, 1·5–2 mm. longae. *Panicula* terminalis, 9 cm. longa, rhachi minute puberula ; rami primarii patuli, 1–4 cm. longi, inferiores ramos secundarios 2

in parte inferiore gerentes ; cymulae sessiles versus apices ramorum dense aggregatae, floribus sessilibus. *Calycis lobi* triangulari-ovati, tandem leviter deflexi, 1·5–1·75 mm. longi, basi 1–1·3 mm. lati. *Petala* 1·5 mm. longa, quam stamina breviora. *Stamina* calycis lobos aequantes. *Ovarium* 2-loculare. *Drupae* haud visae.

CHINA. Yunnan ; *Ducloux*, 601.

450. **Acer Tutcheri**, *Duthie* [Aceraceae] ; species *A. Campbellii* affinis, sed foliis 3–sub-5-lobis, magis coriaceis et panicula breviore differt.

Arbor parva, cortice ramulorum bruneo-purpureo. *Folia* 3–raro sub-5-lobis, 6–7 cm. longa, 8–11 cm. lata, praeter venarum primariarum axillas omnino glabra, basi rotundato-truncata vel aperte cordata, subintegra, lobis triangularibus, acutis vel acuminatis, apicem versus argute serrulatis. *Paniculae* 3–4 cm. longae. *Flores* cum foliis coetanei, 4-meri. *Sepala* 2·5 mm. longa, oblonga, obtusa. *Petala* 1·5 mm. longa, obovata. *Ovarium* dense albo-pilosum. *Samarae* 2 cm. longae, angulo obtusissimo divergentes.

CHINA. Kwantung ; Lantas Island, *W. J. Tutcher*.

The discovery of this new maple is not only of great interest in adding one more species to the limited number representing the genus in tropical regions, but also from the fact of its close affinity to a common Eastern Himalayan species. Besides *A. niveum*, which extends from Assam to the Malay Archipelago, there are at Kew two other species, both of which are undescribed, one collected by Haviland in Borneo, and the other collected by Harmand in Annam. All three have undivided laurel-like leaves with entire margins, resembling the foliage of the common Himalayan *A. oblongum*, which occurs most abundantly in the hotter parts of that range, descending as low down as Dehra Dun.

451. **Astilbe virescens**, *Hutchinson* [Saxifragaceae-Saxifrageae] ; *A. rivulari*, Ham., affinis, sed foliolis glabris marginibus crenatis et staminibus 10 differt.

Folium biternatum, rhachi primaria supra levissime canaliculata, rhachi secundaria basi pilis longis praedita ; petiolulo terminali 5–6 cm. longo, petiolulis lateralibus 1–5 cm. longis ; foliola oblique cordata, acute acuminata, 9–11 cm. longa, 6–9 cm. lata, crasse crenata, crenis denticulatis, denticulis rubris, utrinque glabra ; venae utrinque 5–6, supra impressae, subtus prominentes. *Panicula* ramosissima, pyramidata, ramis divaricatis glanduloso-pubescentibus ; bracteae lanceolatae, membranaceae, bracteolis parvis. *Flores* hermaphroditi, parvi, pedicellati. *Sepala* 5, elliptica, 2 mm. longa, 1 mm. lata, viridia, glabra, supra concava, apice minute bifida. *Petala* nulla. *Stamina* 10, filamentis gracilibus 4 mm. longis glabris ; antherae parvae, rotundatae. *Carpella* 2, glabra, infra medium connata.

CHINA. Without precise locality.

Described from a living specimen communicated by Messrs. James Veitch & Sons, who raised it from seeds collected by Mr. E. H. Wilson.

The flowers of this species are of a pale green colour, and are very sweet-scented.

452. **Passiflora** (§ **Decaloba-Polyanthea**) **altebilobata**, *Hemsl.* [Passifloraceae] ; inter species sinenses *P. Franchetianae*, Hemsl., proxima, a qua parvitate, foliis ultra medium bilobatis a basi trinerviis, fructu minore et seminibus leviter rugulosis recedit.

Frutex vel herba scandens, parva, pubescens, ramis floriferis gracillimis ; internodia foliis breviora. *Folia* petiolata, tenuia, glabrescentia, ambitu ovata, absque petiolo 3–9 cm. longa, ultra medium bilobata, sinu aperto rotundato unisetuloso ; lobi oblongi, divergentes, acuti ; petioli graciles, 1–2 cm. longi, biglandulosi. *Cirrhi* simplices, graciles, quam folia multo breviores. *Flores* albi, circiter 1 cm. diametro, in cymas parvas axillares subsessiles dispositi, extus puberuli, graciliter breviterque pedicellati. *Sepala* et *petala* similia, fere aequalia, oblonga, obtusa. *Corona faucialis* duplex ; coronae filamenta omnia filiformia, exteriora petalis paulo breviora, interiora dimidio breviora. *Corona interior* annularis, margine incurva, irregulariter fimbriato-dentata. *Discus* cupuliformis. *Ovarium* ovoideum, glabrum, gynophoro brevi. *Fructus* globosus, glaber, 1–1·2 cm. diametro, gynophoro circiter 5 mm. longo. *Semina* lenticularia, circiter 4 mm. diametro, leviter rugulosa.

China. Yunnan ; Szemao, at 1200–1500 m., *Henry*, 12987, 12987 A.

453. **Passiflora** (§ **Decaloba-Polyanthea**) **Wilsoni**, *Hemsl.* [Passifloraceae] ; species ex affinitate *P. cupuliformis*, Mast. et *P. Henryi*, Hemsl. ; haec foliis basi rotundatis lobis acuminatis et floribus majoribus glabris, illa foliis arcuato-truncatis et floribus cymosis differunt.

Frutex glaber, alte scandens ramis floriferis gracilibus sulcatis ; internodia quam folia breviora. *Folia* petiolata, tenuia, basi late rotundata, apice truncato-trilobata, lobo intermedio fere obsoleto, 5–10 cm. diametro, latiora quam longa, utrinque 3–nervia, subtus pallidiora ; lobi laterales acuminati ; petioli graciles, eglandulosi, 3–6 cm. longi. *Cirrhi* simplices, graciles, usque ad 15 cm. longi. *Flores* circiter 3 cm. diametro, cymosi, graciliter pedicellati ; cymae saepius in foliorum axillis binae, usque ad 9–florae, petiolos vix superantes. *Bracteolae* minutae. *Sepala* et *petala* similia, ovato-oblonga, obtusiuscula. *Corona faucialis* duplex ; filamenta omnia filiformia, quam petala tertia parte breviora, interiora exterioribus circiter dimidio breviora. *Corona interior* erecta, multiplicata. *Discus* cupuliformis. *Ovarium* glabrum, globosum, gynophora petalis breviore. *Fructus* ignotus.

China. Yunnan ; Szemao, at 1500 m., *Henry*, 11791.

Dr. Henry's 9820 from Mengtze is probably a barren branch of this species.

454. **Senecio homogyniphylla**, *Cummins* [Compositae-Senecionideae] ; species habitu *Homogynem alpinam*, Cass., quam maxime referens, nulli speciei *Senecionis* manifeste affinis, phyllorum apicibus herbaceis et pappi absentia distincta.

Herba scapigera. *Rhizoma* fibris pilisque vestitum. *Folia* longe petiolata, reniformia, marginibus leviter repando-dentata, 2–3 cm. longa, 2·2–4 cm. lata, palmatim 8-nervia, nervis primariis in mucronem minutum excurrentibus, lamina utrinque sparse pilosa, infra saepe purpureo-variegata ; petiolus 2–2·5 cm. longus, fulvo-villosus, imprimis basin versus. *Scapus* 1–cephalus, 16–24 cm. longus, tenuis, sulcatus, sparse pilosus, bracteis 1–plurilinearibus instructus. *Capitula* flava, 2 cm. diametro ; *involucrum* glabrum, supra medium constrictum, *phyllis* 7–10 imbricatis, exterioribus oblongo-linearibus subacutis, interioribus ellipticis obtusis, omnibus infra medium dorso incrassatis ochraceis, supra herbaceis viridibus purpurascentibus. *Flores* lutei, *radii* feminei, ligulati ; *disci* hermaphroditi, corollis tubulosis campanulatis 5-fidis segmentis recurvatis. *Styli rami* recurvati, truncati, penicillati. *Achenia* ovato-oblonga, glabra, 2 mm. longa, epapposa.

Western China. On rocks, without precise locality, *Wilson*, 3783.

455. **Senecio eriopoda,** *Cummins* [Compositae-Senecionideae] ; species scapigera foliis ovato-cordatis, novellis uti scapo inferiore densissime villoso-lanatis.

Herba scapigera. *Rhizoma* fibris pilisque dense vestitum. *Petioli* ad basin etiamque gemmae foliorum similiter obtecti. *Folia* saepe 2, ovato-cordata, acuta, mucronata, sinuato-dentata, 6–10 cm. longa, 4–8 cm. lata, 7-nervia, subtus tomento sordide argenteo appresso vestita, supra pilis sericeis deciduis instructa ; petiolus 5–22 cm. longus, pilosus. *Scapus* pilosus, flexuosus, 36 cm. longus, plerumque ad vel infra medium ramum corymbuliferum emittens. *Corymbi* 2–5 cm. lati, pedunculi 3–4 cm. longi ; bracteae circiter 2 cm. longae. *Capitula* 2 cm. diametro, radiata ; *phylla* circiter 8, 6–8 mm. longa, 1·5–2 mm. lata, sub anthesi tomentosa, deinde glabrescentia, marginibus scariosis. *Flores radii* feminei, ligulati, 3-dentati, 8–15 mm. longi ; *disci* tubulosi, 5-fidi, 11 mm. longi. *Styli rami* recurvati ; stigmata apice subdilatata, penicillata. *Achenia* circiter 3·5 mm. longa, pappo corolla aequilongo vel breviore.

China. Patung ; without precise locality, *Wilson*, 235 ; W. Hupeh ; *Wilson*, 235a.

There are two gatherings of this plant, both made in April. In one the leaves are borne on petioles up to 22 cm. long, the peduncles are 3–4 cm. long, the flowers are past pollination with the anthers empty and the style arms recurved. In the other gathering the leaves have much shorter petioles, about 5 cm. long, and are much firmer. The peduncles are short and the inflorescence consequently contracted, whilst most of the flowers are still unopened and the anthers are full of pollen. The other characters agreeing, the two specimens would appear to represent different stages of one species, one still having its autumnal leaves, the vernal leaves in bud and the flower heads just beginning to open ; the other with the autumnal leaves dropped, the vernal leaves developed and the flowers past pollination.

456. **Anaphalis viridis**, *Cummins* [Compositae-Inuloidae]; affinis *A. xylorrhizae*, Sch.-Bip., sed foliis ovato-rotundatis, capitulis majoribus et phyllis latioribus differt.

Fruticulus humilis, procumbens, undique lana viridi-lutescente dense vestitus. *Rhizoma* crassiusculum, apice ramosum, multiceps. *Folia* 6–10 rosulatim disposita, sessilia, ovato-rotundata, interdum mucronata, circiter 2 cm. longa, 1–2 cm. lata. *Scapus* crassiusculus, vix 12·5 cm. longus, valde lanatus; bracteae 1–3, lineares vel oblongae. *Capitula* 5–10, 1–2 cm. lata, in glomerulum sublaxum conferta; *phylla* circiter 15, ovata, subacuta, 2–9 mm. longa, basi nigrescentia, supra scariosa, nivea. *Pappus* fragilis, caducus.

China. Szechuan; without precise locality, *Henry*, 8922; Tachienlu, 2700–3900 m., *Pratt*, 314; without precise locality, *Wilson*, 3820.

457. **Saussurea acroura**, *Cummins* [Compositae-Cynaroideae]; affinis *S. japonicae*, DC., a qua foliorum lobo terminali lineari-lanceolato et phyllis apice insigniter albo-villosis recedit.

Herba suffruticosa, caule simplici sulcato, circiter 70 cm. alta. *Folia* omnia sessilia, 8–16 cm. longa, 4–8 cm. lata, subtus ad nervos primarios pilosa, supra hirsuta, pilis rigidis appressis, marginibus ciliata, basi auriculata auriculis dentatis vel acute lobatis, pinnatisecta, 6–8-juga, segmentis lateralibus oblanceolatis integris mucronatis circiter 4 cm. longis 1–5 cm. latis, terminali lineari-lanceolato saepissime 5–6 cm. longo. *Bracteae* inferiores foliaceae, superiores lineari-lanceolatae. *Corymbi* stricti. *Capitula* 10 mm. longa, 4 mm. lata, circiter 4-flora; *phylla* dorso marginibusque sparse lanata, obtusa, apice insigniter albo-villosa, breviter mucronata.

Western China. Without precise locality, at 2000 m. *Wilson*, 3894.

458. **Oreocharis** (§**Stomactin**) **aurea**, *Dunn* [Gesneriaceae]. In sectione corollae lobis brevibus distincta.

Herba scaposa, perennis, 20–40 cm. alta. *Folia* omnia radicalia, ovata vel oblongo-ovata, 8–14 cm. longa, grosse bicrenata, chartacea, supra omnino, subtus in venis tantum plus minusve dense hirsuta, acuta, basi leviter rotundata vel secus petiolum in alas irregulares breviter producta, venis crebris ascendentibus, petiolis molliter hirsutis, laminas aequantibus vel eis brevioribus. *Scapa* 20–40 cm. alta, apice in cymam irregularem multifloram bracteatam elaborata, tenuiter hispida, bracteis oblongis, plus minusve incisis. *Flores* flavi. *Calyx* ad basin 5-partitus, lobis linearibus obtusis 8–10 mm. longis molliter hirsutis. *Corolla* tubularis, supra medium constricta, 16–18 mm. longa, extus puberula, lobis 5, 4 superioribus erectis, 1 inferiore reflexo, ovatis imbricatis. *Stamina* 4, corolla duplo breviora, in paribus distantia, ovario excedentia. *Stylus* brevis, stigmate explanato cupulari. *Capsula* 3–4 cm. longa, 5–6 mm. lata, linearis, apice acuta, stylo cupulari persistente; semen minutum ellipticum utrinque acutum.

China, Yunnan; Feng Chen Tin Mts., on trees in the forest at 2000 m.; Mengtze, Mts. to S.E. in forests at 1500 m.; south of the Red River from Manmei at 2000 m., *Henry*, 9713, 9713 A–C.

459. Corytholoma macropodum, *Sprague* [Gesneriaceae] ; habitu *C. canescenti*, Fritsch, similis, indumento necnon glandulis disci omnibus evolutis facillime distinguitur.

Tuber depresso-globosum, circiter 2 cm. altum, 3 cm diametro. *Caulis* simplex, erectus, teres, 8–9 cm. longus, circiter 6 mm. diametro, paria duo foliorum gerens, internodio 5–7 cm. longo, ut petioli, pedunculi, pedicelli, calyces extra pilis glanduloso-capitatis et paucis eglandulosis patenter hirsutus. *Folia* suborbicularia, basi leviter cordata, apice rotundata, 8–9 cm. diametro (inferiora 6–7 cm.), obtuse serrata, dentibus in hydathodia purpurea terminantibus, densiuscule ciliata, supra nitidula, pilis erectis glandulosis inspersis, venis impressis, subtus venis et venulis valde prominentibus densiuscule hirsutis, pilis plerumque eglandulosis, mesophyllo glabro ; petioli 1–2·5 cm. longi. *Cymae* in axillis solitariae, pedunculo 5–8 cm. longo, floribus leviter pendulis pseudo-umbellatis saepius quinque, pedicellis 1–2 cm. longis. *Calyx* intus nitidulus, subappresse puberulus ; tubus 0·5 mm. longus ; lobi ovati, acuminati, 4·5 mm. longi, 2·25–3 mm. lati. *Corolla* pallide cinnabarina ; tubus 2·5–3 cm. longus, fere cylindricus, basi annulatim inflatus, superne leviter ventricosus, extra densiuscule pubescens ; limbus 1·5 cm. latus ; lobi patuli, transverse elliptici, inferiores rubro-maculati, 7–8 mm. lati, 5–6 mm. longi, superiores minores haud maculati. *Disci glandulae* omnes evolutae, circiter 1 mm. altae, duae posticae in ephippium basi 4 mm., apice 2·5 mm. latum (explanatum) connatae ; duae laterales et antica liberae. *Ovarium* pilis acutissimis ascendentibus densiuscule pubescens, stylo circiter 2 cm. longo glanduloso-puberulo, stigmate albo-papilloso ; placentae bilaminatae.

Brazil. Raised from seed received in 1906 from the Botanic Garden, São Paulo.

C. macropodum is evidently closely allied to *C. canescens*, Fritsch, although it differs from the latter in a character which was regarded by Hanstein (in Martius, *Flora Brasiliensis*) as of sectional importance, namely the presence of all five glands of the disc. The corolla is very like that of *C. rupicola*, Fritsch, and the leaves are of much the same shape as in *C. latifolium*.

It may be noted that the name *Corytholoma* should be used for the genus which commonly passes in gardens under the name *Gesnera*, and that the true *Gesneria*, Linn., is what has been called *Pentaraphia* or *Conradia*. The confusion of names arose through the action of Martius (*Nova Genera et Species*, vol. iii., p. 27) in rejecting the name *Gesneria* for the group to which it was applied by Linnaeus, and in using it in the modified form *Gesnera* for a new genus of his own.

Full reasons for the adoption of the name *Corytholoma*, in preference to *Rechsteinera*, are given by Fritsch in *Bih. Svensk. Vet. Akad. Handl.*, vol. xxiv., No. 5, p. 20.

460. Beloperone angustiflora, *Stapf* [Acanthaceae]; affinis *B. violaceae*, Planch. & Lind., sed foliis angustioribus, bracteis late-obovatis apice rotundatis, corollis tubo multo angustiore limbo minore distincta.

Herba perennis, dichotome ramosa; caulis ramique praeter lineas duas tenues pubescentes glabri, ad nodos paulo incrassati. *Folia* oblongo-elliptica vel superiora anguste oblonga vel sublinearia, utrinque acuta, integra, 3–7 cm. longa, 0·7–1·7 cm. lata, supra obscure viridia, in sicco cystolithis numerosissimis albo-striolulata, costa albo-pubescente, praeterea sparse pilosula, subtus pallidiora, in nervis laxe pubescentia, nervis tenuibus; petioli tenues, foliorum intermediorum 6–10 mm. longi, summorum multo breviores. *Inflorescentiae* terminales et ex foliorum summorum axillis, sub anthesi capituliformes, deinde elongatae, densae; bracteae late obovatae, apice rotundatae, basi cuneatim attenuatae, 8 mm. longae, ad 6 mm. latae, supra sparse pilosae, subtus dense minute glanduloso-pubescentes, circumcirca longe ciliatae; bracteolae oblanceolatae, bracteis fere aequilongae, indumento simili indutae. *Calyx* ad basin 5-partitus, segmentis lineari-lanceolatis acutis 5 mm. longis apice tantum pubescentibus marginibus anguste hyalinis. *Corolla* extus puberula, tubo angusto albido 12–14 mm. longo, limbo purpureo-violaceo; labium superum 4–5 mm. longum, minute bilobum; labium inferum 6–7 mm. longum, profunde 3–lobum, lobis divaricatis, lateralibus quam intermedio paulo angustioribus, hoc in fundo maculo albo-pinnato ornato. *Antherae* ad medium labii superioris adscendentes, albae, connectivo latiusculo, thecis inaequaliter affixis, inferiore basi acuta. *Stigma* breviter 2–lobum. *Capsula* clavata, mucronato-acuta, 8 mm. longa, medio in stipitem latiusculum contracta. *Semina* 4, discoidea, minute granulosa, fusca, 1·5–1·7 mm. diametro. *Radicula* leviter curvata, cotyledonibus apposita.

TROPICAL AMERICA. Locality unknown. Raised at Kew from seed received from the Jardin des Plantes, Paris, in 1903.

IV.—AUSTRALIAN GRASSES.

Mr. Fred. Turner, F.L.S., has contributed several interesting articles on Australian plants of economic interest to the *Sydney Morning Herald* during the past year. With the object of making them more generally known, two of them, dealing with the native grasses of Australia, are reprinted here by kind permission of the proprietors of the *Herald* (Sir James Fairfax and Sons). The first article was published on May 28th and the second in the issue of June 13th, 1907.

AUSTRALIAN GRASSES.—I.

Recovery of Native Pastures.—Before the breaking of the last disastrous drought several pastoralists, with much experience of the western country, expressed to me their fears that many of the indigenous grasses had disappeared for ever, and that the grazing areas would in consequence always remain in an indifferent condition, as any plants that survived such unprecedented dry weather would never recover sufficiently to provide valuable pasture herbage for stock. That was the verdict given about much of the

ordinary class of pastoral country, whereas the areas from which the loose surface soil had been blown by wind storms were regarded as irreclaimable "miniature Saharas," as it was asserted that both grass roots and grass seeds had been removed with the soil. At that time I reminded those stock-owners of the wonderful recuperative powers of Australian grasses, of the remarkable vitality of their seeds, and of the depth to which they naturally penetrate the soil, and predicted that after the land had received a good soaking rain the plants would recover, and if they did not regain their pristine vigour, would certainly, with careful and judicious grazing, eventually produce valuable pasture herbage, which would support millions of sheep and other herbivora. My ideas were considered too optimistic then, when it was the fashion to indulge in so much pessimistic talk.

A short time after the breaking of the drought I was botanising in the western country, and saw, as I had previously predicted, millions of acres covered with beautiful verdure that gladdened the heart of the stock-owner. On those at one time almost desert-like tracks the grasses were three feet high or more, and most of the country resembled a magnificent wheat-field just coming into ear. One pastoralist remarked, "It is seven years since I saw a blade of kangaroo grass (*Anthistiria ciliata**), and look at it now." Some of the plants which I measured were four feet three inches high. Another observant grazier in a different part of the West pointed out to me seven species of grass which he had never before seen growing on his station during the fourteen years he had been in possession; and several other stock-owners in various parts of the West gave similar information, and thought the occurrence very remarkable. Those are practical proofs of the wonderful vitality of Australian grass seeds. The seeds must have lain dormant for many years, and when the earth and atmospheric conditions were favourable germinated, and subsequently developed into such fine plants as to make them conspicuous objects in the pastures, and easily recognisable by pastoralists as distinct from those they had been accustomed to see. For some months after the breaking of the drought I received for identification scores of specimens of grasses, especially from those parts where heavy rain had fallen, and many were marked "never observed before" or "never previously seen," and were thought to be quite new to the country. If all such specimens had been unknown to botanists I should have had to name and describe a number of new species, and add them to the already rich and unique indigenous flora of the West. The above facts are very suggestive, and clearly prove the truth of my remarks made at the beginning of this article.

Many Australian grasses have bulbous or thick, knotty bases, which no doubt are provided by nature for storing up food to sustain the plants during very dry weather, and to preserve them from extinction. In adverse seasons, and during prolonged droughts, when every vestige of grass foliage has disappeared, these swollen bases, which are generally enveloped in a woolly substance to prevent evaporation, and their strong, long fibrous roots,

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* Probably *A. imberbis* Retz. (*Themeda Fors-Kalii*, Hack.) Ed.

which penetrate deeply into the earth, remain alive but dormant until the condition of the soil and weather are favourable for them to again put forth green leaves. In January after a heavy fall of rain, I have seen the dormant, woolly, swollen bases of the "tall oat-grass" (*Anthistiria avenacea*) develop leaves, and in four months plants more than six feet high, producing a remarkable amount of rich succulent herbage. This occurred on some of the country west of the Darling River, but on the black soil plains near Moree I have seen that fine grass nearly nine feet high, and that wonderful growth was made in less than five months after heavy summer rain followed by favourable weather. Several species, peculiar to the black country, of the genus *Eragrostis* have large bulbous bases from which a quantity of leafy herbage develops after rainfall, no matter how prolonged the previous dry weather may have been. *Eragrostis eriopoda* and *E. laniflora* are very remarkable plants in that particular. An allied species *E. lacunaria*, is popularly called "never fail" by stockmen, on account of the phenomenal amount of dry weather it can endure. One of the "mulga" grasses, *Danthonia bipartita*, has a large bulbous base and strong fibrous roots, which enable the plant to withstand the torrid heat of Central Australia. After rain quite a number of growths, generally not more than one foot and rarely exceeding two feet in height, are produced from its base and remain vividly green for a considerable time, even if a long period of dry weather ensues. The Mitchell grasses, *Astrebla* spp., which occupy large tracts of country in the interior, have thick, knotty bases, which together with their strong wiry roots, which penetrate deeply into the ground, remain in a dormant condition during protracted droughts, but readily start into growth after a good rainfall. These valuable pasture grasses, more particularly *Astrebla elymoides*, have a branching habit, and in an ordinary season a good shower of rain, such as results from a thunderstorm, will cause new growth to sprout prolifically from the joints of the stems, which are soon covered with a mass of green, nutritious herbage. The above are only a very few of the many instances which could be given to illustrate the wonderful recuperative powers of indigenous grasses.

Vitality of Grass Seeds.—Most Australian grasses, when allowed to grow undisturbed for a time, produce an abundance of seeds which, when mature and kept in contact with dry earth, retain their germinating power for a lengthy period. Several species produce seeds which are comparatively large, when judged by the size of those of cultivated cereals, and which at one time formed an important article of food for the aborigines. The ripe seeds of many indigenous grasses are enclosed in very hard coverings with the lower portions prolonged into points, some being very sharp, notably those of the species of the genera *Aristida* and *Stipa*, popularly called "three-awned spear" and "spear" grass respectively. When these mature seeds fall perpendicularly, which they frequently do, to the ground, they penetrate it, and gradually descend several inches, especially if it is deep and loose. The sharp, pointed seeds, of the "tall oat-grass" have been found nearly a foot below the surface, so that it will be easily understood that although a few inches of surface soil may be removed by

strong winds, the lower stratum or subsoil is often thickly studded with seeds of various species of grass. This method of sowing grass seed is one of the many devices Dame Nature adopts for perpetuating plants under adverse climatic conditions. When good rains fall on those naturally-sown areas, and genial weather ensues, the seeds germinate quickly, and the resulting grass grows rapidly, and soon clothes apparently useless tracts of country with beautiful verdure. Those areas, however, which have a substratum or subsoil of a hard or strong clayey nature, and from which the surface soil has been removed by wind, do not quickly become covered with grass after rain and congenial weather for the seeds, however sharp the points of their coverings may be cannot penetrate that as easily as the more porous earth; consequently there are few, if any, naturally-sown seeds to germinate. Such areas often remain destitute of grass for a considerable time, and in the interior are generally called "scalded plains." After the sun and weather have ameliorated the surface, and made it congenial to plant life, vegetation gradually reasserts itself on those areas, which eventually become covered with beautiful green grass and other herbage.

Distribution of Grass Seeds.—The distribution of Australian grass seeds by natural and artificial means is a most interesting study, and anyone with a little leisure can occupy himself in a most delightful way by noting how the matured seeds are often disseminated. The plumose awns (hairy tufts) surmounting the coverings of the seeds of such species of the genus *Pappophorum* as *P. avenaceum* and *P. nigricans* are wafted hither and thither by the wind in the same way as the fruitlets, with their adherent pappus, of some Composites, and are often deposited some distance from the plants that bore them. Many grass seeds, especially those whose coverings are clothed with clinging hairs, and those whose flowering glumes have long awns, are often distributed far and wide by various agencies, particularly by travelling stock, which, when camped, sometimes unconsciously bury the seeds in the ground, where they lie until rain falls in sufficient quantities to cause them to germinate. I know of an instance where the seeds of one of the "mulga" grasses (*Neurachne Mitchelliana*) were carried by cattle several hundred miles, and deposited in deep, soft soil on the camping-ground, where they germinated after heavy rain, and grew luxuriantly amongst the surrounding dissimilar vegetation. It is not generally known that the vitality of many grass seeds is not impaired by the process of digestion; indeed, the germination of many of the hard-coated ones is facilitated.

The grasses referred to in this article are only typical of a number of others, for it must be obvious that interesting particulars about all the native grasses, or even a small percentage of them, could not be mentioned in the space at disposal.

Australian Grasses.—II.

Economic Value in the Pastures.—As far as is at present known, there are 367 species and many well-defined varieties of grass indigenous to Australia, and they are fairly well distributed over

the continent, quite a number occurring on the so-called desert tracts of Central Australia. All these grasses are not endemic, for many of them are found growing in other warm countries, and several are widely distributed in various parts of the globe. The endemic grasses have a unique position among the vegetable products of the earth, for, in addition to many of them possessing singular characteristics, they include one of the dwarfest and one of the tallest species in the world. The former (*Micraira subulifolia*), which I found on the Glass House Mountains in Queensland, where it forms a dense carpet on the shelving rocks, has very narrow leaves, usually about a quarter, but rarely half, an inch long, and thread-like flowering stems from one inch to two inches high, while the latter, popularly called the "climbing bamboo," has stems more than 200 feet long, which ascend to the tops of the highest trees in tropical Australia. Several indigenous grasses, such as *Festuca divesa*, *Heteropogon insignis*,* *Panicum crus-galli*, *Rottboellia exaltata*, *Sorghum fulvum*,† etc., attain a height of from 8 feet to 12 feet or more, but by far the greater number grow, under normal conditions, from 1 foot to 4 feet high. Together with the famous saltbushes, nutritious herbs, and the many shrubs and trees producing edible and palatable foliage, all of which will be referred to in subsequent articles, they are the most valuable assets on this continent. Without that rich and varied vegetation, it would be practically impossible to feed the millions of sheep, cattle, and horses now depastured in this country. Commercial men frequently make the remark, "What would Australia do without its wool?" But very few ever pause to think what Australia would do without the indigenous herbage which is really the principal factor in creating this valuable staple product. When it is taken into consideration that the pastoral industry is worth about £250,000,000, and yearly increases in value, being the most important one in Australia, and the one from which the population derives its greatest wealth, it is a matter of national importance that more attention should be paid to the valuable indigenous herbage and to the means of saving it from deteriorating in places and of preserving some of it from extinction. Having travelled more than 50,000 miles in Australia, and critically examined much of the indigenous vegetation in all the States of the Commonwealth and in other countries, and having cultivated upwards of one hundred species of Australian grasses in conjunction with those of Europe, Asia, Africa, and America, to test their qualities by comparison, I can conscientiously say that no part of the world possesses richer and more varied pastoral vegetation than Australia, but careful attention and judicious stocking are required in order to obtain the best results.

Early appreciation.—Australian grasses attracted the attention of the discoverers and earliest settlers of this continent, and different views were entertained regarding their economic value. Sir Joseph Banks, to whom Australia is so much indebted for its early settlement, and for the development of its vegetable resources, remarked in one of his papers:—"The herbage of the colony is

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* *Festuca dives* (= *Glyceria dives* of Fl. Austral.), probably a *Poa*; *Heteropogon insignis* (= *Andropogon triticus* R. Br. of Hackel's monograph).—ED.

† *Andropogon serratus* of Hackel's monograph.—ED.

by no means so well adapted to sheep farming as that of Europe, and, therefore, the progress of the flocks will be slow." This opinion, however, was soon controverted, for Captain Waterhouse, in writing to Captain Macarthur in the early part of the last century, mentioned that he had kept sheep, and found them do well on the natural pasturage, and he believed that good pasturage would be found for any number of sheep that might be raised. He therefore ridiculed the idea of artificial grasses being necessary. The opinions entertained by Captain Waterhouse one hundred years ago have been amply verified by subsequent experience. Australian explorers always took much interest in the indigenous grasses which, when abundant, relieved them of much anxiety in providing ample feed for their horses and the stock that travelled with them. Sir Thomas Mitchell, exploring in the interior, collected specimens of grasses, and afterwards wrote an interesting account of the manner in which the aborigines gathered the Australian millet (*Panicum decompositum*), the seeds of which formed for them an important article of food. He writes, *inter alia* :—"The grass had been pulled up to a very great extent and piled in hay-ricks, so that the aspect of the desert was softened into the agreeable semblance of a hay field. The grass was beautifully green beneath the heaps, and full of seeds, and our cattle were very fond of this hay." This native millet is found in greater or less abundance over the whole of Australia. On the margins of rivers and creeks it attains sometimes a height of four feet, but on the plains in the interior it rarely exceeds two feet. It yields a most nutritious herbage, of which stock of all kinds are remarkably fond, and on which they fatten. When brought under cultivation, the Australian millet is a most productive grass, and has yielded three tons of excellent hay per acre. There are 56 known indigenous species of the genus *Panicum* widely distributed, and most of them form a good percentage of the pasture-herbage, and are most valuable forage plants. Many of these grasses withstand a phenomenal amount of dry weather, and are amongst the first to develop new growth after rain.

Blue grass.—Pastoralists call several species "blue grass," and one of the best and most nutritious is *Andropogon sericeus*, which often grows so abundantly on the fertile plains in the interior as to give quite a bluish appearance to large tracts of country. With the exception of the "Mitchell grasses," this species is perhaps the most favourably known of all the western indigenous *Gramineae* to stockmen, and they have formed a high opinion of its virtue as a forage plant. It is essentially a summer grass, and usually attains a height of two feet, but occasionally it is taller. In an ordinary season it yields a great amount of herbage, on which all herbivora thrive and fatten readily. If cut when the flower stems first appear it can be made into excellent hay. There is a very fine, robust variety (var. *polystachyus*) of this species found only on rich soils in the warmest portions of the continent, where it often grows five feet high or more. It is popularly called "tassel blue grass," and is excellent feed for horses and cattle. There are 15 indigenous species of *Andropogon*, which occur in many districts from the coast to the back country, and most of them are excellent pasture grasses. The inflorescence of *A.*

bombycinus is copiously covered with silvery white hairs, which give the plant when in flower a remarkable appearance. This grass grows very plentifully in some parts of the interior, and when in bloom gives one, at first sight, the impression that snow has fallen. "Early spring grass" (*Eriochloa punctata*) is another plant with bluish leaves, which give quite a feature to many grazing areas, both east and west of the Dividing Range. This valuable perennial species attains a height of from two to three feet, and generally grows on rich land, where it produces a great amount of nutritious succulent herbage much sought by all herbivora, which thrive and fatten on it.

The "kangaroo grass" (*Anthistiria ciliata*)* is one of the most widely distributed plants on the Australian continent, but is more abundant in the coastal districts than in the interior. On country that is not heavily stocked it sometimes grows six feet high in good seasons, but generally it does not exceed four feet. In the warmer parts it grows more or less all the year round, but south of latitude 32 deg. it is essentially a summer grass, for it seldom makes much growth before October or November, and remains beautifully green during the hot months. Soon after the flowering stems have developed the leaves turn slightly brown when its nutritive qualities are considered at their highest. All herbivora are fond of and do well on the "kangaroo grass," and horses and bullocks when allowed to graze in pastures where it is growing plentifully can be worked very hard, and still keep in good condition—a practical proof of its value for feeding purposes. Analysis has shown that this grass has a high feeding value. Unfortunately it does not mature as much seed as some of its congeners, consequently it is not as plentiful in many places as formerly. Two other perennial and one annual species of this genus occur in many parts of the continent. The last-named *Anthistiria membranacea* (= *Iseilema Mitchellii* Anderss.), popularly called "Barcoo," "Landsborough" and "Red Gulf" grass, generally grows on rich soils, and covers large tracts of country in the north, and in the interior, including Central Australia. Its seeds germinate readily after the spring and early summer rains, and the resulting grass grows throughout the hottest period of the year. It is generally seen growing in small tufts, but in favourable seasons the weak stems lengthen very much, and form an entangled mass of herbage, often two feet deep. The "Barcoo" grass assumes a reddish tint—hence one of its popular names—and thus gives a singular appearance to large areas of country. It is a most nutritious grass, and in autumn often gets so exceedingly dry and brittle that it breaks up into innumerable pieces, but stock are so fond of it that even then they lick the broken stems and leaves from the ground.

Mitchell grass.—*Astrebla triticoides* is one of three species of the same genus bearing the common name of "Mitchell grass." These famous grasses are found on the fertile plains over a great part of the interior, and many pastoralists and stockmen regard them as the best of all the native grasses, both for their drought-enduring qualities and for their fattening properties. All of them

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* This is *A. imberbis* (*Themeda Forskali* of Hackel's monograph). *A. ciliata* is an annual.—Ed.

have a branching habit, and under ordinary conditions produce a great amount of nutritious herbage, which is greedily eaten by all herbivora. When these grasses become so dry that the stems and leaves break to pieces, stock may often be seen licking them off the ground, and they seem to do well on this feed, notwithstanding its uninviting appearance. Experienced drovers assert that stock travel farther and keep in better condition when fed on these than on any other grasses in Australia—a practical proof of their high feeding value. *Astrebla triticoides* is the tallest and most vigorous of the Mitchell grasses, and may frequently be seen growing from four to five feet high, and forming large tussocks. Its strong, wiry roots penetrate deeply into the earth, and enable the grass to withstand a phenomenal amount of dry weather. The seeds, when ripe, are like small grains of wheat, and at one time formed an important article of food for the aborigines. There is a variety (var. *lappacea*), of this grass, with ears often more than six inches long, somewhat like big wheat ears, and larger seeds than the species, and they separate easily from the chaff-like grains of wheat. Where wheat would not grow, owing to the great heat, that variety might, after a few years of thorough cultivation and careful selection, be found an excellent substitute, for, according to the best authorities, the wheat plant developed from much less promising material.

The "star" or "windmill" grass (*Chloris truncata*) occurs both east and west of the Dividing Range, and generally on the richest soils. It is abundant on some of the inland plains, and forms a good percentage of many of the pastures in the coastal areas. The "star" grass is very variable as regards its height and the size of its inflorescence. It generally grows from two to three feet high, with the inflorescence 15 inches in diameter; but west of the Darling River there is a form which rarely exceeds a foot, being sometimes only six inches high, with the flower spikes only four inches across. On the country bordering the Macquarie River there is a form which has its flower spikes superimposed in whorls on the stem, and they are singularly attractive. On loose soils the grass tillers well and in many places forms a dense turf. Notwithstanding its variations, it yields a rich, succulent herbage, which is much liked by all herbivora, sheep being particularly fond of it, and fattening on it. There are nine species and several varieties of the genus *Chloris* indigenous to Australia, and they are widely distributed. Most of them are excellent forage grasses, having a high reputation with stockowners, who know them as "blue star grass" and "dog's tooth star grass," as well as by the popular names already mentioned.

Sugar grasses.—*Pollinia fulva** is known to pastoralists as "sugar grass" on account of the sweetness of its young stems and leaves. It sometimes attains a height of four feet, and may be easily recognised, when in flower, amongst other vegetation, by its rich, brown, silky inflorescence; hence it is sometimes called "brown top." This very superior pasture grass is generally found on fertile soils, both in the coastal districts and in the interior, but

* *P. fulva* = *P. Cumingii*, var. *fulva* of Hackel's Monograph.

is much more common in the latter. During the summer months, in an ordinary season, it yields a great bulk of sweet nutritious herbage, much relished by all herbivora which fatten on it. Four other species of the genus *Pollinia* occur in the tropical parts of Australia, but none of them is so valuable a pasture grass as the one referred to.

Wallaby.—No other grass in Australia grows under more varied conditions of soil and climate than "wallaby grass" (*Danthonia semiannularis*). It is plentiful on some of the high mountain ranges where snow falls occasionally, and common both in the coastal areas and in the interior. In the coldest districts it grows only six inches high, but under more favourable climatic conditions it attains a height of three feet or more. Although the "wallaby grass" is not particular as to soil and situation, for it may as frequently be seen growing on dry ridges as on the better classes of soils, still it produces a larger quantity of superior herbage on moderately strong, rich, deep land. It is one of the most valuable Australian grasses, and, unlike most of its congeners, grows more or less all the year round. All kinds of stock are remarkably fond of it, sheep particularly so, and thrive on its rich, succulent herbage. There are eleven species and several varieties of the genus *Danthonia* indigenous in Australia most of them widely distributed, and all are excellent forage grasses. The tallest and most remarkable species is *D. robusta* popularly called "ribbon grass," which occurs on the southern mountains, where it forms large tussocks of coarse but nutritious herbage. It usually grows from four to five feet high, but occasionally it is taller and affords shelter for such slender grasses as many species of the genera *Agrostis* and *Deyeuxia*, and other sub-alpine flora.

The grasses mentioned are only a small percentage of the valuable ones indigenous to Australia, but the brief descriptions will suffice to illustrate the great economic value of an important part of the pastoral herbage of this large southern continent.

FRED. TURNER.

V.—THE PRICKLY-FRUITED SPECIES OF EUONYMUS.

T. A. SPRAGUE.

About 100 species of *Euonymus* are known, and of these twelve possess prickly fruits. The latter, however, do not appear to constitute a very natural group, though, for convenience, they may be treated together. Two species have pentamerous flowers and are natives of North America, whilst the remaining ten, which have tetramerous flowers, inhabit eastern and southern Asia. The Asiatic species with prickly fruits might perhaps be regarded as forming a natural group if certain others with scaly fruit, such as *E. vagans*, Wall., are included; but phylogenetic speculation seems premature at the present time. As characters for classification, the length of the petioles, the shape and venation of the leaves, and the prickles of the fruit have been found useful. The practical value of the flowers as a guide to

identification is not very great, owing to the frequent occurrence of polygamy ; many, if not all, of the species of *Euonymus* being polygamo-dioecious or andro-dioecious. According to Darwin,* three forms of flowers are found in *E. europaeus*, Linn., on separate bushes : truly hermaphrodite ; apparently hermaphrodite, but functionally male ; and female. The female flowers can be recognised easily, as they have short stamens bearing rudimentary anthers destitute of pollen, but the functionally male and hermaphrodite flowers are said to be indistinguishable, the pistil and ovules being of the same size and appearance. In *E. subsessilis*, Sprague, and *E. microcarpus*, Sprague, however, two forms of apparently hermaphrodite flowers occur, one of which exhibits greater development of the pistil, and is therefore presumably hermaphrodite, while the other has a less prominent pistil and may be considered as the functional male until experimental proof be forthcoming. No flowers with rudimentary anthers were observed.

It should be noted that the venation of the leaves may alter somewhat during their development ; in *E. echinatus*, for example, the lateral veins are oblique in the young leaves, but become patulous or patent afterwards, and the same appears to hold to some extent in *E. acanthocarpus*. The descriptions of venation here given refer to the mature leaves.

Only three of the prickly-fruited species have come into cultivation as yet, but it seems probable that others may be introduced in the near future. The key and descriptions have therefore been written in English in order to be more generally useful. Technical Latin descriptions are appended of the three proposed new species, and of two additional Chinese ones with spineless fruits.

Key to the species.

Flowers usually pentamerous ; leaves deciduous :—
  Leaves ovate or lanceolate ... ... 1. *americanus.*
  Leaves obovate ... ... 2. *obovatus.*
Flowers tetramerous ; leaves evergreen :—
  Cymes contracted into dense umbel-like inflorescences ... 3. *contractus.*
  Cymes not contracted :—
    Fruits greyish-green or grey in the dried state :—
      Prickles 2–2·5 mm. long ... ... 4. *cinereus.*
      Prickles 6 mm. long ... ... 11. *angustatus.*
    Fruits tawny, brown, or blackish in the dried state :—
      Leaves elliptic or obovate, obtuse or rounded, not acuminate :—
        Prickles 2 mm. long ... ... 6. *acanthocarpus.*
        Prickles 3–4 mm. long ... ... 5. *Hemsleyanus.*
      Leaves oblong, ovate or lanceolate, acuminate :—
        Prickles 1–3·5 mm. long, not flattened :—
          Young branches densely and minutely tuberculate ; petioles 8–15 mm. long ... ... 6. *acanthocarpus.*
          Young branches not tuberculate ; petioles 1–7 mm. long :—
            Veins very oblique, slightly curved, relatively inconspicuous ; prickles 2·5–3·5 mm. long ... ... 9. *scandens.*
            Veins spreading or oblique, strongly curved, forming a distinct network of arches ; prickles 1–1·5 mm. long :—
              Leaves with 6–9 patent or patulous veins on each side of the midrib ; peduncles very slender ... ... 8. *echinatus.*
              Leaves with 4–7 rather oblique veins on each side of the midrib ; peduncles stout, winged ... 7. *subsessilis.*
        Prickles 5–7 mm. long, flattened or not :—
          Petioles 4–6 mm. long ... ... 10. *actinocarpus.*
          Petioles 1–2 cm. long ... ... 12. *aculeatus.*

* Forms of flowers, pp. 287–293.

1. **E. americanus,** *Linn. Sp. Pl.* (1753), p. 197; *Trelease in A. Gray, Syn. Fl.,* vol. i., p. 396; *Britton & Brown, Ill. Fl.,* vol. ii., p. 394; *Britton, Manual,* p. 605; *Small, Fl. S.E.U.S.,* p. 734.

An erect or ascending shrub, 0·5–2·5 m. high. Leaves ovate or lanceolate, acuminate, 4–8 cm. long, 1–2·8 cm. broad; petioles 1–2 mm. long. Peduncle 1–2 cm. long, very slender. Cymes 1–3-flowered. Corolla 8–12 mm. across, greenish-purple. Capsule 3–5-lobed, 1·5–2 cm. across, red; prickles about 1 mm. long. Aril scarlet.

NORTH AMERICA. In low woods and on river banks, from New York to Florida, Nebraska and Texas.

2. **E. obovatus,** *Nutt. Gen.*, vol. i. (1818), p. 155; *Trelease, l.c.* 397; *Britton & Brown, l.c.; Britton, l.c.; Small, l.c.*

A low decumbent shrub, seldom rising more than 0·3 m. from the ground, with trailing branches, rooting at the nodes. Leaves obovate, usually obtuse, 2·5–5 cm. long, 1·25–3·5 cm. broad; petioles 2–4 mm. long. Peduncle 1–3 cm. long, very slender. Cymes 1–3-flowered. Corolla 6–8 mm. across, greenish-purple. Capsule 3-lobed, 1·5–2 cm. across, crimson. Aril scarlet.

NORTH AMERICA. In low woods and on river banks, from Ontario and Pennsylvania to Illinois and Tennessee.

3. **E. contractus,** *Sprague*, n. sp.

A bush, 0·6 m. high. Leaves elliptic-oblong, obtuse, 2·5–4 cm. long, 1·5–2 cm. broad, coriaceous; lateral veins patulous, very inconspicuous in the dried state; petioles 3–5 mm. long. Peduncle 4–10 mm. long. Cymes twice to four times forked, contracted into dense umbel-like inflorescences. Corolla 7–8 mm. across, white. Capsule not known.

WESTERN CHINA. On cliffs, 1050 m., *Wilson*, 3327.

4. **E. cinereus,** *Laws. in Hook. f. Fl. Brit. Ind.*, vol. i., p. 611 (1875).

A scandent shrub, with densely tubercled branches. Leaves obovate, rounded, obtuse or very shortly acuminate, 4–7 cm. long, 2–4 cm. broad; lateral veins oblique, easily seen in the dried state; petioles 5–9 mm. long. Peduncle 1–1·5 cm. long in fruit. Flowers not known. Capsule depressed, greyish-green, about 1·3 cm. across, including the prickles; prickles 2–2·5 mm. long.

ASSAM. Mishmi Mountains, Lai Pani, *Griffith*, 1975.

5. **E. Hemsleyanus,** *Loes. in Engl. Jahrb.*, vol. xxx., p. 460 (1902).

A shrub, rather over 1 m. high. Leaves obovate, elliptic or elliptic-oblong, rounded, obtuse or very shortly acuminate, 2·5–6 cm. long, 1·5–3 cm. broad; lateral veins oblique, easily seen in the dried state; petioles 3–7 mm. long. Peduncle 5–7 mm. long, up to 1·5 cm. long in fruit. Cymes once or twice forked. Corolla about 7 mm. across, green. Capsule pale brown in the dried state, rather over 1 cm. across, including the prickles; prickles 3–4 mm. long.

YUNNAN. Mengtze, 1350 m., *Henry*, 9120 ; in crevices of rocks on mountain flanks in the Mengtze plain, *Hancock*, 492.

6. **E. acanthocarpus,** *Franch. Pl. Delav.* (1889), p. 129 ; *Loes. in Engl. Jahrb.*, vol. xxx., p. 459.

A shrub, 3–4 m. high, with densely tubercled branches. Leaves lanceolate or oblanceolate, more rarely ovate or obovate, shortly acuminate, 5–12 cm. long, 1·5–5 cm. broad ; lateral veins rather oblique, easily seen on the upper surface in the dried state, and more or less inconspicuous on the lower ; petioles 8–20 mm. long. Peduncle 1–6 cm. long. Cymes twice to five times forked Corolla about 7 mm. across, greenish-yellow. Capsule about 1 cm. across, including the prickles ; prickles 2 mm. long.

YUNNAN. On Mt. Che-tcho-tze, above Tapintze, *Delavay*, 2816 ; Mengtze, N. Mts. 2100 m., *Henry*, 10544 B, 10304.

SZECHUAN. Mt. Omi, *Wilson*, 3330 A, 4784 A.

HUPEH. Fang, *Wilson*, 1280 ; Paokang, *Wilson*, 2150, 2150 A ; Patung district, *Henry*, 3706 ; Nanto, *Henry*, 2991.

7. **E. subsessilis,** *Sprague*, n. sp.

A shrub, 2–2·5 m. high. Leaves elliptic-oblong, lanceolate or ovate, acuminate, 4–9 cm. long, 1·5–4 cm. broad ; lateral veins rather oblique, anastomosing at a considerable distance from the margin to form a loose network which is very evident, especially on the lower surface ; petioles 1–2 mm. long. Peduncle 1–3 cm. long, conspicuously winged. Cymes twice or three times forked. Corolla 7–8 mm. across. Capsule brown in the dried state, hardly 1 cm. across, including the prickles ; prickles 1–1·5 mm. long.—*E. echinatus*, Loes. in Engl. Jahrb., vol. xxx., p. 459, non Wall.

HUPEH. Neighbourhood of Ichang, *Henry*, 3116, 3511, 3511 A, 3511 B.

SZECHUAN. Mt. Omi, 1050 m., *Faber*, 198 ; Mt. Omi, *Wilson*, 4784, 4785.

8. **E. echinatus,** *Wall. in Roxb. Fl. Ind. ed. Carey*, vol. ii. (1824), p. 410 ; *Laws. in Hook. f. Fl. Brit. Ind.*, vol. i., p. 611, partly ; *Duthie, Cat. Pl. Kumaon*, p. 32.

A scandent shrub. Leaves elliptic-oblong or lanceolate, less frequently ovate, acuminate, 3·5–8 cm. long, 1·5–3 cm. broad ; lateral veins patent or patulous, anastomosing to form a rather close network which is usually more evident on the upper surface ; petioles 3–7 mm. long. Peduncles very slender, 1–2 cm. long. Cymes once or twice forked. Corolla 7–8 mm. across, green. Capsule under 1 cm. across, including the prickles ; prickles 1–1·5 mm. long.

SIKKIM. *Hooker.*

NEPAL. *Wallich.*

KUMAON. Binsur Peak, about 2,200 m., *Strachey & Winterbottom.*

GARHWAL. *Herb. Falconer*, 361.

KASHMIR. Jamu hills, *Thomson*,

Distinguished from the following by the venation of the leaves and the shorter prickles. Both species are represented on the single sheet of *Wallich*, 4285, in the Linnean Society's Herbarium; but Wallich's description leaves no doubt as to which he had in mind.

9. **E. scandens**, *R. Graham in Edinb. N. Phil. Journ.*, Jan.–Mar. 1827, p. 386.

A tall scandent shrub. Leaves ovate, ovate-lanceolate or elliptic, acutely acuminate, 4–8 cm. long, 1·8–3·5 cm. broad; lateral veins oblique, not forming a distinct network; petioles 3–7 mm. long. Peduncles slender, 1–2 cm. long. Cymes twice or three times forked. Corolla 5 mm. across, yellowish-white. Capsule over 1 cm. across, including the prickles; prickles 2·5–3·5 mm. long.—*E. echinatus*, Hook. in Bot. Mag. t. 2767; Laws. in Hook. f. Fl. Brit. Ind., vol. i., p. 611, *partly*, not of Wallich.

NEPAL. *Wallich.*

10. **E. actinocarpus**, *Loes. in Engl. Jahrb.*, vol. xxx., p. 459 (1902).

Leaves ovate or elliptic-oblong, acuminate to the apex, obtuse or rounded at the base, 6–9 cm. long, 2–4 cm. broad, pale green, almost glaucous on the lower surface; lateral veins rather oblique, the more prominent ones about five a side, easily seen on the upper surface in the dried state, rather inconspicuous on the lower; petioles 4–6 mm. long. Peduncles distinctly winged, 2·5–3 cm. long in fruit. Cymes three or four times forked. Flowers not known. Capsule about 1·7 cm. across, including the prickles, pale brown in the dried state; prickles 5 mm. long.

HUPEH. Nanto, *Henry*, 4399 (quoted by mistake as 4339 in the original description).

11. **E. angustatus**, *Sprague*, n. sp.

Leaves rhomboid-elliptic, acuminate to the apex, conspicuously cuneate at the base, 5–9 cm. long, 2–4 cm. broad, shining above, dull below; lateral veins oblique, about six a side, conspicuous on the upper surface in the dried state, inconspicuous on the lower; petioles 7–12 mm. long. Peduncles narrowly winged, 3–4 cm. long in fruit. Cymes four or five times forked. Flowers not known. Capsule over 2 cm. across, including the prickles; prickles 7 mm. long, very flattened towards the base.—*E. echinatus*, Hemsl. in Journ. Linn. Soc. Bot., vol. xxiii., p. 119, *partly*, not of Wallich.

KOWLOON. Near Tai-mo-shan, *Herb. Hongk.*, 639.

CHINA. Without locality or collector's name *Herb. Hook.*

Wright, 32, from the Liukiu Islands, quoted by Hemsley l.c., may belong to *E. angustatus* or to an undescribed species allied thereto. The Liukiu specimen is in flower only, and *E. angustatus* is known in fruit only; hence a satisfactory comparison cannot be made.

12. **E. aculeatus**, *Hemsl. in Kew Bull.* 1893, p. 209; *Loes. in Engl. Jahrb.* vol. xxx., p. 459.

A large scandent shrub. Leaves elliptic-oblong, obovate-oblong or lanceolate, acuminate to the apex, more or less cuneate at the base, 6–17 cm. long, 2–6 cm. broad, coriaceous; lateral veins oblique, five to seven on each side of the midrib, more or less inconspicuous on both surfaces; petioles 1–2 cm. long. Peduncle winged, 1·5–5 cm. long. Cymes three to five times forked. Corolla 8–10 mm. across. Capsule immature, 1·3 cm. across, including the prickles; longest prickles about 5 mm. long, tawny, very flattened.

HUPEH. South Patung, *Henry*, 6143; W. Hupeh, *Wilson*, 1284.

SZECHUAN. South Wushan, *Henry*, 5335 A.

YUNNAN. Mengtze; S.E. mountains, 1500 m., *Henry*, 10733.

NOVARUM SPECIERUM DESCRIPTIONES.

Euonymus contractus, *Sprague*; affinis *E. Hemsleyano*, Loes., a quo venatione foliorum et inflorescentiis contractis subglobosis recedit.

Frutex 0·6 m. altus. *Folia* elliptico-oblonga, obtusa, 2·5–4 cm. longa, 1·5–2 cm. lata, coriacea, venis lateralibus patulis exsiccando fere occultis; petioli 3–5 mm. longi. *Pedunculi* 4–10 mm. longi. *Dichasia* bis usque quater furcata, contracta, umbelliformia, pedunculis secundariis et tertiariis brevissimis; pedicelli 2·5–4 mm. longi. *Flores* 8 mm. diametro. *Sepala* semielliptica, exteriora 0·75 mm. longa, 1·5 mm. lata (ab exteriore visa), interiora 1 mm. longa, 2–2·5 mm. lata. *Petala* alba, orbicularia, 3·5 mm. diametro, carnosa, tandem valde convexa. *Discus* quadratus, 2–2·5 mm. diametro. *Filamenta* subulata, 2·5–3 mm. longa; antherae vix ultra 1 mm. diametro. *Ovarium* verrucosum, ovulis 2 pro loculo collateralibus pendulis; stylus quadrangularis, circiter 1 mm. longus, demum 1·5 mm. longus. *Capsula* ignota.

WESTERN CHINA. On cliffs, 1050 m., *Wilson*, 3327.

Euonymus subsessilis, *Sprague*; affinis *E. acanthocarpo*, Franch. et *E. echinato*, Wall.; a priore foliis subsessilibus, a posteriore venatione laxiore, pedunculis crassioribus alatis recedit.

Frutex 2–2·5 m. altus. *Folia* elliptico-oblonga, lanceolata vel ovata, acuminata, 4–9 cm. longa, 1·5–4 cm. lata, venis lateralibus satis obliquis, satis procul a margine anastomosantibus, exsiccando conspicuis praesertim subtus; petioli 1–2 mm. longi. *Pedunculi* conspicue alati, 1–3 cm. longi. *Dichasia* bis vel ter furcata; pedicelli 3·5–4 mm. longi, iis florum hermaphroditorum verruculosi. *Flores* 7–8 mm. diametro. *Sepala* hyalino-marginata, in floribus hermaphroditis distincte ciliolata. *Petala* suborbicularia, 3–3·5 mm. diametro, margine inflexo. *Discus* 2·5 mm. diametro in floribus masculis, 2 mm. in floribus hermaphroditis. *Filamenta* subulata, 1·5–1·75 mm. longa. *Ovarium* in floribus hermaphroditis prominens, distincte 4-lobum, verruculosum, in floribus masculis paullo ab disco elevatum, papillosum; stylus circiter 1 mm. longus; ovula 2 pro loculo, collateralia pendula. *Capsula* exsiccando brunnea, vix usque ad 1 cm. diametro, aculeis inclusis; aculei 1–1·5 mm. longi. *Semina* vix 5 mm. longa, in arillo omnino inclusa.—*E. echinata*, Loes. in Engl. Jahrb. vol xxx., p. 559, non Wall.

HUPEH. Neighbourhood of Ichang, *Henry*, 3116, 3511, 3511A, 3511B.

SZECHUAN. Mt. Omi, 1050 m., *Faber*, 198; Mt. Omi, *Wilson*, 4785, 4784.

Euonymus angustatus, *Sprague*; affinis *E. actinocarpo*, Loes., et *E. aculeato*, Hemsl.; a priore forma foliorum, a posteriore aculeis fructus multo crassioribus recedit.

Frulex, ut videtur. *Folia* rhomboideo-elliptica, acuminata, basi conspicue cuneata, 5–9 cm. longa, 2–4 cm. lata, supra nitida, subtus opaca; venae laterales obliquae, utrinque circiter 6, supra conspicuae, subtus inconspicuae; petioli 7–12 mm. longi. *Pedunculi* anguste alati, sub fructu 3–4 cm. longi. *Dichasia* quater vel quinquies furcata. *Flores* ignoti. *Capsula* ultra 2 cm. diametro, aculeis inclusis; aculei circiter 44, 7 mm. longi, versus basin valde complanati. *Semina* 7–8 mm. longa, arillo omnino inclusa. —*E. echinatus*, Hemsl. in Journ. Linn. Soc. Bot. vol. xxiii., p. 119, partim, non Wall.

CHINA. Kowloon, near Tai-mo-shan, *Herb. Hongk.*, 639; China, without locality or collector, *Herb. Hook.*

Euonymus microcarpus, *Sprague*; ab *E. chinensi*, Lindl. foliis peracutis sensim acuminatis, capsulis brevioribus depressis, antheris florum masculorum haud sessilibus recedit.

Arbor 6 m. alta. *Folia* elliptica vel ovata, peracute sensim acuminata, basi cuneata, tenuiter coriacea vel chartacea, 5–8 cm. longa, 2·5–4 cm. lata, venis lateralibus obliquis approximatis leviter curvatis tantum, reticulatione haud conspicua; petioli 0·7–2 cm. longi. *Pedunculi* 1·5–3 cm. longi. *Dichasia* bis usque quarter furcata; pedicelli 1·5–5 mm. longi. *Flores* ut videtur androdioici. ♂ 9 mm. diametro. *Sepala* brunneo-ciliolata. *Petala* suborbicularia circiter 3 mm. diametro, ciliolata, patentia, demum deflexa, marginibus lateralibus reflexis. *Filamenta* 1·5 mm. longa. *Antherae* reniformes, apiculatae, 0·8 mm. latae. *Stylus* circiter 0·75 mm. longus. *Ovula* 2 pro loculo, collateralia, descendentia. ♂ (functione) 5 mm. diamerto. *Petala* 2 mm. diametro. *Filamenta* 0·5–0·75 mm. longa. *Stylus* vix 0·3 mm. longus. *Capsula* depressa, circiter 1 cm. diametro, 5 mm. longa, immatura profunde lobata. *Semina* in arillo omnino inclusa, vix 5 mm. longa.—*E. chinensis* var. *microcarpus*, Oliv. ex Loes. in Engl. Jahrb. vol. xxx., p. 456.

HUPEH. Nanto, *Henry*, 3073; Ichang, *Henry*, 1397 (masc.), 1650 (fruct.), 3099 (fruct.), 3580 (masc.).

WESTERN CHINA. Without precise locality, *Wilson*, 3332.

Euonymus mengtseanus, *Sprague*; affinis *E. Griffithii*, Kurz., et *E. theifolio*, Wall.; a priore foliis petiolatis, a posteriore ramulis alatis haud tuberculatis, a speciebus ambabus floribus majoribus recedit.

Arbuscula 3 m. alta, ramulis quadrialatis. *Folia* obovato-elliptica vel elliptica, basi obtusa, apice obtuse acuminata, acumine 7–10 mm. longo, 6–9 cm. longa, 2·5–4 cm. lata, tenuiter coriacea, venis lateralibus patulis in rete distinctum satis remote ab margine

anastomosantibus supra insculptis subtus prominentibus ; petioli 7–10 mm. longi. *Pedunculi* 1·5–2 cm. longi. *Dichasia* semel vel bis furcata ; pedicelli 5–8 mm. longi. *Flores* 10–13 mm. diametro. *Sepala* glanduloso-ciliolata. *Petala* suborbicularia circiter 4·5 mm. diametro. *Discus* 4 mm. diametro. *Antherae* sessiles, 1 mm. latae. *Ovula* 2 pro loculo, collateralia, pendula. —*E. theifolius* var. *mengtseanus*, Loes. in Engl. Jahrb. vol. xxx., p. 455.

YUNNAN. Mengtze, S.E. mountain forests, 1500 m., *Henry*, 10684.

Closely allied both to *E. Griffithii* and *E. theifolius*, and evidently nearer the former. *E. Griffithii* and *E. mengtseanus* have smooth, 4-winged branchlets, whereas *E. theifolius* has tubercled, 6–8-ribbed branchlets.

VI.—YEHEB.

(*Cordeauxia edulis*, Hemsl.)

History.—The existence of this interesting Somaliland plant appears to have been first recorded in June, 1895, by the late Capt. M. S. Wellby, 18th Hussars, whose death was announced in the *Kew Bulletin* for 1901, p. 171. Wellby refers to it, as 'Yee-ep,' in several passages in his *Report of a Journey in Somaliland in* 1895.

After an interval of ten years, a sample of its seeds, under the name "'Yebb' nuts," was forwarded to the Imperial Institute in June, 1905, by Col. E. J. E. Swayne, C.B., at that time H.M.'s Commissioner, Somaliland Protectorate, with the object of having their nutritive value determined. A subsequent consignment reached the Imperial Institute at a later date, from the same source. A quantity of seeds from this later consignment was sent on March 30, 1906, to Professor A. H. Church, F.R.S., who brought some of these seeds to the Herbarium at Kew for identification. From the material supplied, identification was impossible, but a few of the seeds were sown, and two small plants were obtained.

On April 23, 1906, another small supply of 'Yebb' nuts was sent direct to Kew from the Imperial Institute ; it was of course impossible to identify the 'nuts,' and none of them germinated. At the same time it was stated that they came from Somaliland, so that it was possible to try to secure herbarium specimens.

This proved to be a somewhat difficult matter, but at length, through the sustained efforts of Capt. H. E. S. Cordeaux, C.B., H.M.'s Commissioner, Somaliland Protectorate, specimens were obtained, which reached Kew on July 29, 1907, and showed conclusively that 'Yeheb' or 'Yehib'—for Capt. Cordeaux uses both forms—is a Leguminous plant belonging to a previously unknown genus of the *Caesalpinieae*, most nearly allied to, but very distinct from, the genus *Schotia* in the tribe *Amherstieae*.

This information was at once communicated to the Imperial Institute and the necessary diagnoses were drawn up. These

appeared in the *Kew Bulletin* for 1907, No. 9, p. 361, issued in October last ; the plant has since been figured in *Hooker's Icones Plantarum*, vol. xxix., tt. 2838, 2839.

The names of three British officers must always remain associated with the history of 'Yeheb' ; that of Capt. Wellby as having first recorded the existence, appearance, and properties of the plant, and as having supplied precise records of its occurrence ; that of Col. Swayne as having first recognised the possible importance of its seeds as a food-stuff and appreciated how necessary it was to obtain scientific evidence as to their chemical composition and nutrient value ; that of Capt. Cordeaux as having been the first to procure, with much pains, the herbarium material required for the botanical determination of the species.

Material for Study.—If the history of our knowledge of 'Yeheb' be simple, the task of unravelling it has been less easy. The first intimation of the existence of 'Yeheb' to reach Kew was the reference here, in the beginning of April, 1906, by Professor Church, of some seeds, termed 'Yebb' nuts, with the information that they were of an interesting chemical composition, but with no clue to their origin. A memorandum accompanying a consignment of seeds of the same species, sent to Kew by the Imperial Institute on April 23, 1906, described them as "'Yebb' nuts from Somaliland," but said nothing as to their properties. There was nothing to indicate, and owing to the interval between their receipt it did not happen to suggest itself, that there might be a connection between these two sets of seeds.

No trace of the name 'Yebb' could be found in the literature or the correspondence at Kew, but the clue to their origin supplied by this memorandum led to communication with correspondents who had travelled in Somaliland or were interested in its vegetation. The result was not encouraging, since those consulted appeared unacquainted either with the name or with the plant.

Fortunately, on June 27, 1906, the Rev. Dr. Warre, while visiting Kew, learned our difficulty, and although unable himself to afford direct assistance, kindly volunteered to try to help indirectly. His aid was prompt and effective. On July 6, 1906, Dr. Warre wrote :—"I enclose a letter which I have received "from Capt. Troyte, of the K.R.R., who was all through the "Somaliland business. I am afraid that it does not throw much "light on the subject of the nut, but it at least indicates the "quarter from which information may be obtained, viz., Major "Cordeaux, the Consul-General at Berbera." A letter asking for information and help was despatched to Capt. Cordeaux.

Before a reply could be received from Berbera, Professor Dunstan, F.R.S., wrote to Kew, under date July 18, 1906 :—
"Last April I sent to you a specimen of Yebb nuts from Somali-
"land for identification. Mr. Hemsley, in his letter of 27th April,
"stated that it had not been possible to identify the nuts, but that
"as they apparently retained their germinative power it was hoped
"to determine their botanical origin later. I shall be glad if you
"will let me know whether it was possible to raise any plants
"from the seeds, and if so, whether you have any clue to the

"botanical source of the 'nuts.'" On July 19 Kew replied that 'Yebb' still remained a mystery; that no plants had come up from the seeds sent on April 23, but that two small plants had been raised from some seeds previously received at Kew. The letter further stated that Kew assumed that these earlier seeds also came originally from Somaliland although Somaliland correspondents who had replied to our enquiries appeared not to have heard of 'Yebb,' and added that Kew had been put in touch by Dr. Warre with a correspondent in Somaliland, so that definite information was still hoped for.

To the letter begging for his help in the matter Capt. Cordeaux replied as follows, in a letter received on August 17 :—

"Camp Arioleh, Berbera, July 28th, 1906.

"I write to acknowledge the receipt of your letter of the "6th instant asking for further information about the Yebb nut.

"There is no doubt that these nuts really do come from "Somaliland, though I believe they are not to be found actually "within the British Protectorate limits.

"The Yebb or Yeheb (which spelling more correctly "represents the native pronunciation) is a small bush which "grows in great quantities in the 'Haud' or waterless desert south "of Bohotleh and of the southern frontier of the Protectorate. "I have never myself seen the bush which is described by "Wellby in his *Reports on Journeys in Somaliland* as 'a small "'thick-leaved bush, always green, with a nut enclosed in a thin "'crisp shell and eaten stewed. If the green leaves are rubbed "'in the hands, they are stained red.'

"The nuts, which according to Professor Dunstan's recent "analysis, evidently possess great nutrient value, form the staple "article of food of the poorer classes of natives living in the "'Haud,' and are for the most part consumed as they are collected. "Small quantities of the nuts, however, find their way amongst "the northern tribes and even as far as the coast towns, where "they are eagerly bought by the Somalis, who have great faith in "their nutrient and medicinal properties, often preferring them to "their usual dietary of rice and dates. The bush is said to seed "itself readily and to grow with great rapidity.

"I will endeavour to obtain the herbarium specimens you "require, but fear this may take some time, owing to the distance "(some 150 miles) of the Yeheb country from our most "advanced post. It is also difficult to get natives to bring in "good specimens at the first attempt, many of them being spoilt "and damaged on the journey before they can be properly pre-"pared. I hope, however, to be able to obtain some sufficiently "good specimens to enable you to identify this interesting plant, "and will despatch them as soon as possible to your address at "Kew."

The information regarding Yeheb contained in this letter was the first to reach Kew; in addition to its intrinsic value it enabled us to obtain the *Report* by Capt. Wellby, the existence of which had been unknown to us. The importance of Wellby's information, which will be considered below, lies in the fact that 'Yeheb' was known to him at first hand.

The next letter from Capt. Cordeaux is as follows :—

"Berbera, January 2, 1907.

"I much regret that I have as yet been unsuccessful in obtain-
"ing the herbarium specimens of the Yehib tree which you
"asked for. The specimens which the natives I have sent out
"have brought in have not been worth sending you. I recently
"sent a more intelligent man for the purpose and I hope that he
"will be more successful.

"In the meantime it may interest you to know that I have
"succeeded in rearing four small plants in my garden at Berbera
"from the nuts, despite the asseverations of the Somalis that the
"tree would not grow anywhere except in the 'Haud.'

"If these young plants continue to do well, and failing other
"specimeus, I will send you specimens taken from them."

This letter was followed shortly afterwards by another :—

"Berbera, January 30, 1907.

"I am sending you to-day a specimen of a small Yehib bush
"which has just been brought in to me. I fear that it is not a
"very good specimen as it has suffered considerably from the long
"journey down to the coast. The Somali who brought it declares
"that it was in blossom when he dug it up but unfortunately they
"[the flowers] have all dried up and fallen off, as has happened
"to most of the leaves. I hope however that the specimen may
"be of some use. The Somalis say that the bush has very deep
"roots and that even in the case of this small bush the roots were
"about six feet long. The black core which you will notice
"running down the centre of the main root is curious. It is also
"to be observed that if the leaves are slightly moistened and
"rubbed between the fingers a magenta-coloured stain is produced.

"The young plants which I have grown here from seeds are
"fairly healthy but are making very slow progress. They have
"been doing better since I have stopped watering them."

The bush referred to in this letter reached Kew on February 26, 1907. It is somewhat over two feet in height from above ground, densely virgate and in shape reminds one of a birch broom. The black core of the stout root recalls the heartwood of *Dalbergia Melanoxylon*, Guill. & Perrotet. This bush is now exhibited in Kew Museum No. I., Case 42, and a reduced figure of it is given in *Hooker's Icones Plantarum*, vol. xxix., t. 2838. Though of interest as conveying an accurate impression of the habit of 'Yeheb' it does not, in itself, suffice to throw light on the botanical identity of the plant. Consequently to a reminder from the Imperial Institute, dated March 6, 1907, it was necessary to reply that the identification of 'Yebb' nuts was still impossible, and in the interesting article on the subject published in the *Bulletin of the Imperial Institute*, vol. v., p. 19—the analytical part of which we are able, through the courtesy of Professor Dunstan, to reproduce below—it was stated that "it has not "been possible to ascertain the botanical origin of the nuts." The analysis in question, it will be observed, though not published till 1907, is referred to in the letter of July 28, 1906, addressed to Kew by Capt. Cordeaux. This circumstance led Kew inadvertently

to conclude that Capt. Cordeaux was the Commissioner of the Somaliland Protectorate mentioned in the Imperial Institute *Bulletin* as having sent the seeds there.

In a letter to Kew dated June 19, 1907, Dr. Warre showed his continued interest in the subject by sending some 'Yeheb' beans from Somaliland. These beans proved to be identical with the seeds received in April, 1906, but none of them germinated.

Capt. Cordeaux at last succeeded in procuring specimens, and on July 26, 1907, the following letter from him reached Kew :—

"Berbera, *via* Aden, July 8, 1907.

"I have made several attempts to obtain specimens of the "flowers of the Yeheb bush, but I fear without much success. "The last specimens I received arrived crushed almost out of all "recognition, and as they had evidently been picked during, or "immediately after, rain, they were nearly all mouldy and "rotten.

"One small sprig, however, seemed worth keeping, aud this I "endeavoured to press and now enclose. I am afraid it cannot be "regarded as a botanical specimen, but it may help to identify the "genus of the bush.

"I am also sending by parcel post a few of the less damaged "specimens that arrived at the same time, together with some "Yeheb nuts in the pod, which you may not have seen.

"I trust you may be able to discover something of interest from "these rather meagre specimens, and I shall be very interested to "hear the result. The word Yeheb I should say is a purely "Somali word, and as far as I have been able to ascertain has no "particular meaning, and is merely the native (Somali) name for "the plant."

From the material thus supplied by Capt. Cordeaux it was possible, in spite of the fact that the expanded flowers were all more or less damaged by insects, to draw up a complete description of the plant: an uninjured flower-bud afforded the information necessary as regards the number and relative position of the parts, while the injured flowers supplied material for the remaining figures in *Hooker's Icones Plantarum*, tt. 2838, 2839.

On July 31st, 1907, the identification of the 'Yeheb' plant was sent to the Imperial Institute.

On August 1st Dr. Warre sent seeds from a fresh consignment of 'Yeheb' nuts from his friend in Somaliland, coming from a different quarter from those sent before. From these seeds a considerable number of healthy young plants came up; these plants have grown more rapidly and look much stronger than the two first raised.

The Imperial Institute memorandum of April 23, 1906, and the article in the Imperial Institute *Bulletin*, No. 1 of 1907, give no precise locality in Somaliland for the 'Yeheb' seeds sent for identification. In the hope of obtaining more definite information on this point, a letter was addressed to the Institute on August, 7, 1907. The reply, dated August 8th, stated that :—
"The only information which we have regarding the geographical "origin of the seeds submitted to you is the following statement

"by the Commissioner of the Somaliland Protectorate in for-
"warding the sample:—'The nut grows wild in the Haud
"'waterless wilderness, south of Bohotleh, and is much sought
"'after as food by the Dolbahanta Somalis.'"

This letter adds nothing material to the information which Kew had already obtained, and, the 'Haud' being an extensive area, still leaves the precise locality of the material on which the botanical description of 'Yeheb' is based somewhat doubtful. But the similarity of the statement quoted above with that contained in the letter, dated July 28, 1906, from Capt. Cordeaux, only strengthened the impression—now known to be erroneous—that Capt. Cordeaux was the Commissioner of the Somaliland Protectorate who had sent the samples of 'Yebb' nuts in the first instance to Professor Dunstan. From the information actually available it was necessary to say that the material from which the descriptions published in the *Kew Bulletin* were drawn up consisted of:—"Seeds from Prof. A. H. Church, F.R.S., and Prof. W. R.
"Dunstan, F.R.S. An entire plant, detached flowers and pods,
"from Captain H. E. S. Cordeaux, C.B., H.M.'s Commissioner."

In a letter to Kew, dated October 22, 1907, Professor Dunstan has pointed out that this statement with regard to the sources of the material is somewhat misleading, owing to the fact that the seeds given to Kew by Professor Church were handed to Professor Church by himself for an opinion as to their nutrient value; and to the further fact that the sample from which these seeds were selected had been sent to the Imperial Institute in the first instance by Col. Swayne, when the latter was H.M.'s Commissioner in Somaliland. In a subsequent letter, dated November 12, 1907, Professor Dunstan has added that the seeds corresponding to those sent by him to Kew on April 23, 1906, were sent to Professor Church on March 30, 1906. Professor Dunstan explains that the credit for bringing 'Yebb' nuts to light is entirely due to Col. Swayne, who realised their probable importance as a food stuff in 1905, and since then has interested himself greatly in the subject.

The misleading nature of the reference was unavoidable, since Kew had no means of ascertaining these facts until Professor Dunstan supplied them. His communication was, however, opportune, and it was possible to include it in the account of 'Yeheb' that accompanies the figures published in *Hooker's Icones Plantarum*, vol. xxix., tt. 2838, 2839.

Properties and Uses.—Captain Wellby (*Report on a Journey in Somaliland in* 1895; *Appendix* ii., *Vegetation*, p. v.) describes 'Yeheb' briefly as follows:—"99. Yee-ep; Hawea.—Small thick-
"leaved bush, always green; after the rains the fruit is collected.
"Kind of nut enclosed in a thin crisp shell. Should be eaten
"stewed. If the green leaves are rubbed in the hands, they are
"stained red." The bush sent to Kew by Capt. Cordeaux, which is about two feet high, is spoken of by him as a small example, but as Capt. Cordeaux has not himself seen the plant growing wild and as Capt. Wellby has not definitely indicated its size we are unable to state even approximately its maximum height. That it it has a remarkably deep tap-root is clear, and as Capt. Cordeaux

in one passage refers to 'Yeheb' as a "tree" it is probable that at times it is of considerable size. Whatever its extreme limits may be we know that 'Yeheb' has a densely virgate habit and a hard wood that ultimately becomes ebonised at the core. The compound evenly pinnate exstipulate leaves are from 1–2 in. long; the leaflets are usually 4-paired, leathery, oval-oblong, from $\frac{1}{2}$–1 in. long, and densely beset beneath with reddish flat glands; if the leaves be soaked in water the fluid takes up from these glands a reddish dye, while as Capt. Wellby and Capt. Cordeaux state if the leaves be rubbed in the hand, these glands stain the skin reddish or magenta. The flowers, which are not numerous, are arranged in small corymbs, very little longer than the leaves, at the ends of the branches. The sepals, which are oblong-obtuse, are about $\frac{1}{3}$ in. long, and are glandular like the leaves. The petals are spathulate and clawed, rather over $\frac{1}{2}$ in. long. The stamens, ten in number, are free and bearded below. The ovary, shortly stipitate, is glandular like the sepals and leaves. The fruit is a crisp, leathery, compressed-ovoid, 2-valved pod, beaked at the tip and from $1\frac{1}{2}$–$2\frac{1}{2}$ in. long. The seeds, popularly but erroneously spoken of as "'Yeheb' nuts," are from $1\frac{1}{4}$–2 in. long; they have no albumen but have thick fleshy cotyledons and are used as an article of food. For an account of the structure and nature of the peculiar dye-yielding glands on the leaves, sepals and pistil, reference may be made to an interesting note, with a figure in the text, by Mr. L. A. Boodle in *Hooker's Icones Plantarum*, vol. xxix., under tt. 2838, 2839.

The behaviour of young 'Yeheb' plants under cultivation is dealt with in the following memorandum by Mr. W. Watson, Curator, Kew :—"Plants of 'Yeheb' have been raised at Kew "from seeds received, first from Professor Church in April, 1906, "and secondly from Dr. Warre in August, 1907. The seeds were "sown in tropical moist conditions and germinated readily, the "second lot being stronger than the first, probably because the "seeds were fresher. Kew has now 25 healthy young plants, "the strongest being six inches high with dark-green evenly "pinnate somewhat leathery leaves. In every case the first pair "of leaves are opposite, but subsequent leaves in some of the "plants are arranged alternately on the stem. So far the plants "appear to enjoy the moist heat of a tropical stove; this, however, "is quite usual with seedlings of dry-country plants which after-"wards show a preference for drier conditions. Judging from "present appearances it is probable that 'Yeheb' will not be "difficult to cultivate in tropical countries."

Writing on August 17th, 1907, with regard to the 'Yeheb' seeds referred to in his letter of August 1st, Dr. Warre says :—"The "day before yesterday three of my 'Yeheb' nuts germinated and "are now about an inch above ground. These are from the new "batch. Those sown from the old batch have made no sign. The "little plants differ from anything I have seen before and are "very interesting; little dirty-white fleshy stems, covered over "with small red specks." In later letters Dr. Warre speaks of these young plants as flourishing and growing fast, but more recently their growth has been slower and less satisfactory, and they have shown a tendency to drop some of their leaves. As we have seen,

even at Berbera, the young plants raised by Capt. Cordeaux after a time called for a change in treatment. Capt. Cordeaux quotes his native informants as stating that in its natural habitat 'Yeheb' grows with great rapidity.

Col. Swayne states that the seeds of 'Yeheb' are much sought after as food by the Dolbahanta Somalis. Capt. Cordeaux describes them as being the staple food of the poorer inhabitants of the 'Haud' to the south of Dolbahanta, and adds that besides using the seeds as food, often in preference to their ordinary diet of rice and dates, the Somalis ascribe to them medicinal properties. He tells us also that though the seeds are mostly consumed locally, some of them find their way to and are readily bought by the Somalis of the coast towns. As to this Capt. Wellby too has explained that Mudug, a small district which serves as a buffer between the Dolbahanta, Midjourten and Marehan territories, is regularly visited by khafilas of merchants both from Berbera on the north and Obbia on the east coasts. These merchants bring cloth and dates which they exchange for gums, sheep, ghi, feathers and Yee-ep, "a fruit peculiar to these parts." Capt. Wellby does not, however, state that 'Yeheb' is a native of Mudug.

In the *Bulletin of the Imperial Institute*, vol. v., p. 19, we are informed that 'Yeheb' nuts have formed the principal food of the Somalis during the famines induced by the severe droughts which have prevailed in Somaliland during recent years.

The analysis of kernels selected from the second consignment sent to the Imperial Institute, which Professor Dunstan has permitted us to reproduce, gave the following results :—

		Per cent.
Moisture		9·3
Ash		3·1
Sugars	Reducing	2·3
	Cane	21·6
Carbohydrates (other than sugars), by difference		37·1
Proteids	Albuminoids	11·8
	Amides	1·3
Fibre		2·7
Oil		10·8
Nutrient ratio		1 : 6·5
Nutrient value		92

"The nuts were tested for alkaloids and glucosides, but no "indication of the presence of such constituents was obtained.

"The results of the analysis indicate that the nuts are likely to "prove a useful food-stuff. A satisfactory point is the presence of "considerable quantities of sugars and oil in addition to the "carbohydrates.

"Judging from the analytical figures alone, the nutrient ratio, "*i.e.*, the ratio of albuminoids to carbohydrates and oil converted "into their starch equivalents, is a very serviceable one, and the "total 'nutrient value' is high. The kernels are rather tough, "and this point raises some doubt as to the complete digestibility "of the carbohydrates other than sugars.

"In preparing the nuts for use as food, it is desirable that they "should be soaked in just such a quantity of water as they can "absorb, since if more be used there is danger of loss of the sugars, "which would diffuse into the excess of water."

We have already seen that in Hawea, according to Capt. Wellby, the seeds are stewed before being eaten.

Col. Swayne says 'Yeheb' is wild; Capt. Cordeaux in his letters implies as much. Capt. Wellby speaks of the collection of Gum and 'Yeheb' in Marehan, which probably again implies that it is wild. But Capt. Wellby speaks of 'Yeheb' being 'grown' in Hawea, thus suggesting the possibility that sometimes it may be deliberately planted.

Geographical Area. The material sent by Col. Swayne to the Imperial Institute, and that sent by Capt. Cordeaux to Kew is reported to have come from the 'Haud' or wilderness south of the Dolbahanta country; both say to the south of Bohotleh. Capt. Wellby has explained that seeds of 'Yeheb' which reach the northern coast towns may come from beyond the 'Haud.' No precise locality can yet be given for the material sent by Dr. Warre, but the second lot of seeds came from "a different quarter" from the first. Capt. Wellby's records are precise. He first records 'Yeheb' from Galkayu (Lon. 47° 30′ E.; Lat. 6° 45′ N.) in Mudug, but does not leave it clear that the plant grows in Mudug. He again records it from Adawilif (Lon. 46° 50′ E.; Lat. 5° 55′ N.) in Marehan, clearly indicating that it is there a native. Once more he records it from Gofoddo (Lon. 45° 40′ E.; Lat. 4° 38′ N.) in Hawea. Mudug lies at the south-eastern corner of the 'Haud,' where the Dolbahanta, Midjourten and Marehan countries most closely approach each other. Marehan lies immediately south of the eastern 'Haud'; Hawea is immediately south of Marehan.

Capt. Cordeaux shows that probably 'Yeheb' is not native in the Dolbahanta country, and does not occur anywhere north of the 'Haud'; Capt. Wellby does not record it from Midjourten, east of the Haud. Moreover this officer crossed and recrossed the 'Haud' from Rayarri to Hodayuwein and from Hodayuwein to Bohotleh; later on he crossed the 'Haud' a third time from south to north rather further to the west. He did not record the presence of 'Yeheb' in any of these traverses, all of which were made to the west of the region indicated by Col. Swayne and Capt. Cordeaux. There is no record of its occurrence in Ogaden, which lies immediately south of the western 'Haud.'

'Yeheb' then occurs in Hawea, where it is possibly sometimes planted, in Marehan and perhaps also in Mudug, and is reported from the eastern 'Haud' to the south of Bohotleh; whether its area extends beyond these limits is not known.

The size which the plant attains; whether the plant is ever planted, and if so to what extent; and its precise range are points that can only be satisfactorily cleared up by residents or travellers in Somaliland, to whose attention the whole subject is commended. The present account may, however, enable those who wish to help in settling similar problems to appreciate how necessary it is to supply at the outset complete material and full information.

VII.—MISCELLANEOUS NOTES.

Visitors during 1907.—The number of persons who visited the Royal Botanic Gardens during the year 1907 was 2,962,714. These figures represent an increase of 623,222 visitors over the year 1906, when the numbers were 2,339,492 and up to that time had established a record. The total number on Sundays was 1,268,501, and on weekdays 1,694,213. The corresponding numbers for 1906 were 867,148 and 1,472,344 respectively. The maximum attendance on any one day was 92,277 on August 5th, over 20,000 less than on the corresponding day in 1906, when the attendance was a record one for a single day. The smallest number on any one day was 168 on April 26th.

The detailed monthly returns are given below :—

January	39,685
February	46,845
March	219,498
April	186,092
May	406,867
June	347,709
July	473,309
August	553,814
September	485,201
October	115,735
November	49,154
December...	38,805
	2,962,714

THE REV. RICHARD BARON.—The Rev. Richard Baron, F.L.S., F.G.S., who died suddenly from heart failure on October 12th, 1907, was well-known both to botanists and geologists. He was born at Kendal on the 8th of September, 1847, and was educated at a local school and afterwards at Owens College. He went out to Madagascar first in 1872, under the London Missionary Society's auspices. He remained working as a missionary in Madagascar for 35 years, with occasional furloughs to England. Mr. Baron learnt languages with great facility and was soon able to speak and read Malagasy with fluency. His books in Malagasy, on geology and botany, his French exercises, his biblical commentaries and several of the most popular hymns in the Malagasy Hymnal will long remain witnesses to his varied activity. During his 35 years Madagascar changed greatly and passed from Hova to French dominion. The Hovas pursued a policy of isolation. King Radama used to say that his best generals were "General Fever and General Forest," and when Mr. Baron prepared a small handbook of elementary chemistry he was refused leave by the then Prime Minister to publish it, unless he would omit all mention of the metals. The road between Tamatave, the chief port, and Antananarivo, the capital of the Island, which in Hova times took a fortnight to traverse, now takes a couple of days, and

if the projected railway be made, will only take a few hours, as the distance between the two places is only 200 miles. Mr. Baron first took up the study of Botany in 1880. He was elected a Fellow of the Linnean Society in 1882, and between 1880 and 1905 sent to Kew upwards of 7,000 numbered specimens of plants. His collections were made chiefly in the three central and elevated provinces of Imerina and Betsileoland and Tanala, and as this region had been but little explored previously and fully three-quarters of the plants of Madagascar are endemic, he discovered a thousand new species, which were described by Mr. J. Gilbert Baker principally in the XXth and XXVth vols. of the *Journal of the Linnean Society*. When at home on furlough in 1888 Mr. Baron contributed to the Linnean Society a valuable paper on the regions of Botany in Madagascar (*Journ. Linn. Soc.*, vol. xxv., pp. 241–294, with a map).

Studying, during a furlough at home, under an eminent petrologist, the peculiarities of rock structure, he became an expert himself in such investigations. During Mr. Baron's last visit to Europe his paper at the Geological Society on Madagascar geology led to his election as a Fellow of that Society. A further mark of scientific appreciation of his work was shown by the gift of a valuable microscope for the study of rock structure from the Royal Society and also by the award of the Murchison grant for geological research. A gold medal from the Marseilles Exposition and the Vice-Principalship of the Académie Malgache are also proofs of the appreciation of his scientific knowledge by the French officials. Being an authority on Malagasy, geology, botany and French he was offered valuable appointments, but always refused to leave mission work and take up service under the Government. Repeated attacks of malarial fever and finally an attack of blackwater fever weakened his strength and he returned to England for the last time in April of the present year. He was playing with his children on the sands at Morecambe within an hour of his death. The funeral took place at Kendal on Wednesday, October 16th, and was largely attended by his relatives and representatives of various missionary societies.

J. G. B.

WILLIAM NATION, who died at Clapham on October 18th at the age of 81, was born at Staplegrove, Somerset, in 1826. He entered the Royal Gardens in 1840, whence he proceeded to Peru in 1850 and was head gardener to a Spanish gentleman; later he was appointed a Professor at Gaudeloupe College, Lima. He contributed plants to the Herbarium from 1862 to 1880 and several of his letters are also preserved. One of his plants was figured and described in the *Botanical Magazine* under the name of *Quamoclit Nationis* by Sir William Hooker (*Bot. Mag.* t 5432) and tubers of this plant, which, before he died, he desired to present to the King, have recently been received at Kew from His Majesty.

Flora Capensis.—Continued progress is being made with this work, which is edited by Sir W. T. Thiselton-Dyer on behalf of the South African colonies. Since the notice in the *Kew Bulletin*

for 1906, p. 186, two more parts (iii. and iv.) of vol. iv., sect. 1, have been issued. In the earlier of the two, Mr. N. E. Brown has completed the account of the *Ericaceae*, in the later he has commenced an account of the *Asclepiadaceae*. The other orders dealt with in part iii. are the *Plumbagineae*, *Primulaceae*, *Myrsineae*, *Sapotaceae*, *Ebenaceae*, and the *Oleaceae* partly. In part iv. the *Oleaceae* are completed, the *Salvadoraceae* and the *Apocynaceae* are dealt with and, as stated above, the *Asclepiadaceae* are begun. The *Ebenaceae* have been described by Mr. W. P. Hiern, the *Plumbagineae* and *Salvadoraceae* by Mr. C. H. Wright, and the *Apocynaceae* by Dr. O. Stapf. For the *Primulaceae*, *Myrsineae*, *Sapotaceae* and *Oleaceae* the editor has been able to make use of the manuscript accounts prepared by the late Professor W. H. Harvey; the additions rendered necessary owing to the communication of further material from South Africa since Professor Harvey's death have been supplied by Mr. C. H. Wright.

Hooker's Icones Plantarum.—Founded by the late Sir William Hooker in 1837, this publication has now reached the second part of the twenty-ninth volume and the 2850th plate. This part contains the figure of *Cymbogon citratus*, Stapf, which was first published in the *Kew Bulletin* for 1906, but the letterpress is here limited to a Latin description and the synonymy of the plant. Sir Joseph Hooker contributes the description of *Impatiens dorstenioides*, Warb., syn. *Trimorphopetalum dorstenioides*, Baker, a very singular plant, native of Madagascar; and two plates are devoted to the illustration of *Cordeauxia edulis*, the 'Yeheb' nut of Somaliland. The majority of the figures, however, are of Chinese plants, chiefly belonging to the *Lardizabalaceae* and the *Hamamelidaceae*. *Sinofranchetia* is a new genus of the former group. *Parvatia* and *Holboellia* are reduced to *Stauntonia*, of which seven species are figured and eight described. Of the *Hamamelidaceae*, *Sycopsis*, *Distylium* and *Altingia* are revised, and a number of new species described. *Peglera capensis*, Bolus, is a neogeneric type, doubtingly placed in *Legnotideacae*, though it has also evident affinities with *Simarubaceae*.

Botanical Magazine for November.—The following plants are figured and described. *Arctotis decurrens*, Jacq., *Rhododendron intricatum*, Franch., *Coelogyne Lawrenceana*, Rolfe, *Oldenlandia dolichantha*, Stapf, and *Shortia uniflora*, Maxim. The *Arctotis* is a handsome South African species recently reintroduced into cultivation from Namaqualand, whence Mr. W. E. Gumbleton of Belgrove, Queenstown, received seeds, only one of which germinated. The plant obtained from this seed has bloomed for the sixth time this year, and furnished the material figured. It is a perennial herb 2–3 feet high, with solitary flower-heads about 3 inches across, the ray-florets white above, with a dark purple spot towards the base, and reddish purple beneath. The species was originally introduced into Europe in 1794. *Rhododendron intricatum* is a Chinese species with small leaves and clusters of

very small violet or lilac flowers. The plant attains a height of 18 inches, but flowers when only 4 to 6 inches high. The species has been brought into cultivation by Messrs. James Veitch & Sons, who presented to Kew the plant illustrated. The handsome *Coelogyne* is another of Messrs. Sander's introductions from Annam, where it was discovered by their collector, Mr. W. Micholitz. The large flower has yellow or greenish-yellow sepals and petals, and a reddish-brown lip, with a white front lobe marked with sulphur-yellow. The drawing was made from a plant presented by Messrs. Sander. *Oldenlandia dolichantha* is an annual Rubiaceous plant from East Tropical Africa, and was discovered and sent to Kew by Mr. M. T. Dawe, Officer in Charge of the Forestry and Scientific Department of the Uganda Protectorate. The white flowers are remarkable for the long slender corolla-tube. The pretty little *Shortia uniflora* is a native of Japan, and the Kew plants were purchased from a firm of Yokohama nurserymen. This species is most nearly allied to *S. galacifolia*, Torr. & Gr., found only in North Carolina, and provides one more instance of the affinity of the Japanese and Eastern North American floras.

Botanical Magazine for December.—The plants figured are: *Gesnera cardinalis*, Lehm., *Primula muscarioides*, Hemsl., *Picea morindoides*, Rehder, *Delphinium candidum*, Hemsl., and *Eria longispica*, Rolfe. The *Gesnera* is an ornamental plant with scarlet flowers 2½–3 inches long, and has been in cultivation for many years. The *Primula* is a distinct new species from Western China, where it was collected by Mr. G. Forrest for Mr. A. K. Bulley, of Neston, Cheshire, in December, 1904, at altitudes of from 14,000 to 15,000 feet. The capitate-spicate arrangement of the small purple-blue or almost violet flowers gives it something of the appearance of a *Muscari*. *Picea morindoides* is a native of the Eastern Himalaya, and was first described in 1903 from specimens obtained from Mr. Allard's arboretum at Angers in France. It is also in the garden of Earl Annesley at Castlewellan, and in that of Sir Edmund Loder at Leonardslee, Horsham, Sussex, where it has produced cones for the first time in this country. The *Delphinium* is a new species with large white flowers; seeds were collected by Lady Hindlip between Mount Elgon and Kisumu, Uganda, in 1904, and the plant figured was raised in the gardens at Hindlip Hall, Worcester. It is a very beautiful species. In the figure the flowers are represented with the spurs bent over, but from a recent photograph of a more robust specimen it appears that the spurs should be straight. The scent of the flowers is more like that of the Eucharis Lily than of the Primrose, as stated in the *Magazine*. *Eria longiscapa* is a new Bornean species allied to *E. latifolia*, Reichb. f., from which it differs in having larger flowers, with an orbicular, not obovate, lip. It has long slender racemes crowded with somewhat small, light-yellow flowers blotched with reddish purple. The plant has been in cultivation at Kew since 1898, when it was presented by Messrs. Linden of Brussels. The volume of the *Magazine*, which is concluded with this number, is dedicated to Miss E. A. Willmott, F.L.S., V.M.H., of Warley Place, Essex.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 2.] [1908.

VIII.—MUSEUM PREPARATIONS.

The Preservation of Green Colours in Botanical Specimens Exposed to Light.

J. W. H. Trail.

The alteration caused in green parts of plants after exposure to light for some time, whether these are dried or in preservative fluids, renders them unsightly, and deprives them of much of their value by obscuring or obliterating the distinction in colour between the assimilating tissues and the other parts of the specimen. With specimens in fluid, especially when preserved in alcohol, it is customary to bleach them until all parts are deprived of colour before they are admitted to the shelves of museums. Such bleached specimens are indeed preferable to the brown ones that are apt to result where alcohol is used without previous bleaching; and they have the further advantage, when bleached, of not discolouring the preservative fluid. But the uniformity of tint, whether brown or colourless, greatly lessens the usefulness of even the most carefully prepared specimens, especially in an educational museum, and I have sought by various methods to preserve the green colours at least sufficiently to indicate the important difference in function between the green parts and the other organs of plants. The various methods in use and the various solutions recommended as preservatives were tried, and, while partially successful in certain cases, all were unsatisfactory in results, or difficult to employ and liable to fail.

I had tried acetic acid as a preservative fluid; and found that although specimens, especially small bodies, such as galls, hermetically inclosed in glass tubes, retained their form in it they became discoloured. The effect of the salts of copper on the colour of vegetables preserved for food was known to me; but the value of copper as an aid in the preparation of permanent specimens for teaching, and for exhibition in museums, suggested itself to me more clearly after reading Dr. E. Schunck's papers on the chemistry of chlorophyll. I sought to obtain the formation within the green parts of the specimens of the compounds of

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chlorophyll with copper that Dr. Schunck had shown to remain green when exposed to light. I at first made use of acetate of copper dissolved to saturation in strong acetic acid, one part of the solution being diluted with four of water. In this solution the specimens were allowed to steep for a month or more, they were then washed in clean water for a few minutes until clear of all trace of surface deposits of acetate of copper; and they were then transferred to any preservative fluid desired. A short account of the process is given in a report on methods employed by me for preservation of specimens submitted to a committee of the British Association, and printed in the Report of the meeting in Liverpool in 1896. As stated in that account, the method was found to give excellent results in certain cases, the green being quite permanent, and almost natural, except for a bluish tinge in it.

But in other cases the specimens became brown while being steeped in the solution of acetate of copper; and as the browning seemed worst in those plants, such as Oak, that contained much tannin, I supposed for a time that it was a compound of tannin formed with the copper that caused the discolouration. I continued to use the method, trying it with different groups of plants, and varying the details as to concentration. The more rapid and effective absorption of certain dyes and other substances by dead than by living protoplasm suggested the advantage of killing the protoplasm in the specimens as rapidly as possible. It was found that in the preservation of *Spirogyra* in conjugation, and of other algae that it was desirable to keep in stock for the use of students during the year, good results were obtained by boiling the material in a solution of acetate of copper before putting it into the preservative, whether formaldehyde or spirit. The compound of chlorophyll with the copper was formed very rapidly, in the hot solution, before any change due to decomposition had begun.

The extension of the method to larger specimens naturally followed, with very marked improvement in these as compared with the continued steeping in the cold solution. The hot solution penetrated more thoroughly and rapidly, and the green compound was formed in the tissues killed by the hot acid before decomposition had time to begin. Many plants were found to remain green when boiled in the solution of acetate of copper even of those that had always become brown when merely steeped in the cold solution. Another very great advantage of the use of heat is that it shortens very much the time required, the duration of treatment depending on the permeability of the tissues of each specimen. One or two minutes suffice for green seaweeds, and for submerged parts of vascular plants on which the cuticle is very thin, if present at all. The leaves and young stems of most plants require above five minutes' boiling. Those with thick cuticles and few stomata naturally require somewhat longer, up to 15 or 20 minutes in the more refractory specimens, the time to be allowed varying with the structure of the plants, and having to be estimated by experience.

After they have been boiled in the solution, and well washed in cold water to remove any surface deposits of acetate, they may be put at once into the preservative fluids, or they may be dried, if

suitable for that treatment. In either method they will usually show little change of colour when exposed to light. The green is often almost like that of the living plants; but in many it is more blue than natural, though retaining a decided green wherever chlorophyll was present in the living plant. In some cases where the specimens appeared brownish when removed from the boiling fluid the brown colour has been replaced by green in the spirit. Rarely does the colour become changed for the worse after permanent mounting.

When it is desired to preserve the green colour of dry specimens that are to be exposed to light they may be boiled in the solution of acetate, washed in pure water and dried, either by exposure to dry air, or in dry sand, or between sheets of botanical paper in the usual way, the method of drying being selected to avoid distortion in drying. Inflorescences of grasses give good results when simply exposed to dry air.

The colours of flowers and fruits are variously affected by this treatment. Some are destroyed by it, others, *e.g.*, the reds of rose-hips and various fruits, are largely retained. Occasionally curious results are obtained, as in the flowers of *Salvia splendens*, in which the colour disappeared from the corolla, but remained to a considerable extent in the calyx. The markings of variegated plants are well retained where these are pale on a green ground; and even where due to pigments or coloured sap these colours can often be recognised in the prepared specimens, even where much of their intensity has been lost.

An incidental advantage of the treatment is that the rapid killing of the tissues in the boiling solution lessens greatly the tendency to dismemberment by loss of leaves and even of branches, so troublesome in certain groups of plants, this result being more marked the shorter the time between the gathering of the specimens and the boiling. It is helpful in the treatment of such plants as *Sedum acre*, which are apt to remain alive for some time in the drying paper. It also helps to protect specimens against injury from fungi, so often hurtful in fluid preparations and in herbaria.

The experiments on the numerous plants selected by me for treatment were very carefully carried on by John Davidson, attendant in the Botanical Department of the University, and I take this occasion of expressing my appreciation of his services in this investigation.

Certain families of plants give less favourable results than one usually obtains, a dark exudation appearing on the leaves of some species. Probably further experiments will show means of overcoming some at least of these difficulties. Of course the treatment is not suitable for specimens so fragile that they would suffer injury from being boiled, even where the colour is well kept. But in many families the results are excellent, and in by far the most, even of the less favourable, the form is scarcely affected, the green parts remain clearly distinguished by their colour, and the educational value of the specimens is by so much the greater. It would be tedious to give a detailed statement of the effects of the treatment on the several plants subjected to it. The method is a

very simple one, and can be easily tried by anyone who wishes to test its worth. I believe it will be found useful. It is also economical in the saving of preservative fluids due to the lessened tendency to discolouration of these fluids by solution of substances (chlorophyll, &c.) from the specimens.

The method of treatment found to give the best specimens is as follows:—Saturate the volume (say one gallon) of commercial strong acetic acid with acetate of copper, shaking the bottle occasionally until no more will dissolve, some acetate being left at the bottom of the bottle. Pour off the clear solution, and add an equal volume of distilled or very soft water. Of this fluid enough is poured into an open enamelled or earthenware dish to allow the specimens for treatment to be submerged in it while it is being boiled over a suitable gas-burner. The specimens may be put at once into the boiling fluid, and should be kept sunk in it for periods as stated above, varying with their texture from two minutes to about twenty minutes. The fumes of boiling acetic acid are apt to be irritant to the eyes, nose, and throat, and also injure certain metals; hence it is well, if possible, to boil the specimens in a fume chamber, or in a place where the vapour can readily escape. The specimens should be lifted out with wooden forceps, and if they appear to have been boiled long enough they should be washed for a few minutes in water, and if necessary brushed or rubbed to remove deposits on their surfaces. They may then in most cases be prepared at once for permanent preservation, either in any of the usual preservative fluids, or dried.

IX.—DIAGNOSES AFRICANAE: XXI.

911. **Popowia Mannii**, *Baill. Adansonia*, vol. viii., p. 320 (1868) [Anonaceae]; descriptio emendata (auct. *T. A. Sprague*).

Frutex 1–1·5 m. altus (fide *Foster*). *Folia* obovato-oblonga usque ad elliptica, apice breviter obtuse acuminata, interdum leviter retusa, basi rotundata vel subcordata, 8–16 cm. longa, 3·5–6·5 cm. lata; petioli 2–5 mm. longi. *Petala* interiora in alabastro late ovata, demum subspathulata. *Ovarium* 1–3-ovulatum. Ceterum ut in descriptione Bailloniana.—*Clathrospermum Vogelii*, Oliv. in Fl. Trop. Afr., vol. i. (1868), p. 25, quoad specimen Mannianum. *C. Baillonii*, Scott Elliot in Journ. Linn. Soc., vol. xxx., p. 70 (1894). *Popowia Baillonii* Engl. et Diels in Engl. Monogr. Afr. Pfl., vol. vi., p. 48 (1901).

Sierra Leone. Bagru River, *Mann*, 809. S. Nigeria. Oloke Meji, *Foster*, 312.

Ovaries from Mann's specimen had two ovules, those from Foster's only one, but there appears to be no other difference between the specimens apart from the degree of pubescence.

Perhaps too much stress has been laid on the number of ovules in *Anonaceae*. Evidently Bentham found only one ovule per carpel on first examining Mann's specimen, but found 2–3 ovules on subsequent examination. In a manuscript note by Bentham attached to the sheet bearing Mann's specimen is the statement "Ovula solitaria erecta"; the last two words have been subsequently crossed out by Bentham and "2–3, superposita" substituted.

Engler and Diels in their monograph of the African Anonaceae, have changed the name of *Popowia Mannii*, Baill., to *P. Baillonii*, Engl. et Diels, and applied the name *P. Mannii*, Engl. et Diels, to another species, *Clathrospermum Mannii*, Oliv., apparently under the impression that *C. Mannii* was published before *P. Mannii*, Baill. *Adansonia*, vol. viii., p. 305, however, shows that Baillon's description was published on May 30th, 1868; Oliver's was published in July, 1868 (see *Kew Bull.*, 1905, p, 29).

It is therefore necessary to rename *P. Mannii*, Engl. et Diels (*Clathrospermum Mannii*, Oliv.), and inasmuch as it appears to be the only African species of *Popowia* with unisexual flowers, the name *Popowia diclina*, Sprague, seems appropriate. *P. diclina* is apparently dioecious, for the two sexes have not hitherto been collected together.

912. **Hibiscus crassinervius,** *Hochst. ex A. Rich. Tent. Fl. Abyss.*, vol. i., p. 61 [Malvaceae-Hibisceae]; descriptio amplificata (auct. *T. A. Sprague*).

Frutex ramis elongatis strictis 2–4 mm. diametro aspere fulvo-vel superne brunneo-tomentellis. *Stipulae* subulatae, ± curvatae, 3–5 mm. longae, tomentellae. *Folia* ovata vel elliptica, apice obtusa, basi rotundata, 1·3–4 cm. longa, 1–2·5 cm. lata, serrulata, aspera, basi 5-nervia, pilis stellatis supra dense pubescentia vel tomentella, subtus dense tomentella; petioli 3–10 mm. longi, dense tomentelli. *Flores* primum solitarii in axillis, denique ex iisdem axillis ramuli abbreviati 1–2-flori orti. *Pedunculi* 1–3 cm. longi, sub fructu 4–8 mm. infra apicem articulati. *Bracteolae* 9-12, lineares, versus apicem dilatatae, 3·5–8 mm. longae, superne 0·75–1·2 mm., inferne 0·5–0·6 mm. latae, basi 0·5–1 mm. connatae, trinerviae, breviter stellato-tomentellae praesertim extra. *Calyx* extra breviter stellato-tomentellus et pilis magnis brunneis stellatis hirsutus, intus minutissime appresse pubescens; tubus 2–2·5 mm. longus, 10-nervius reticulatione haud manifesta; lobi subulato-lanceolati, 3–7 mm. longi, ima basi 2–2·5 mm. lati, trinervii, nervo medio conspicuo, marginalibus inconspicuis. *Petala* oblongo-obovata vel obovata, 1·2–1·5 cm. longa, 6–7·5 mm. lata, basi 2·5–3 mm. adnata. *Stamina* 35, in verticillos quatuor disposita, quorum infimus pentandrus, circiter 0·5 mm. supra petala insertus, ceteri decandri filamentellis geminatis in verticillis mediis usque ad apicem, in supremo ultra medium connatis; filamentella circiter 4 mm. longa; columna staminea tota 7–8 mm. longa, 1·5–2 mm. ultra verticillum supremum producta, dentibus 0·25–0·3 mm. longis. *Ovarium* ellipsoideum, 2·75–3 mm. longum, dense appresse albo-pubescens, loculis 5-ovulatis; styli glabri pars communis 5–6 mm. longa, ramis 6·5–7 mm. longis. *Capsula* circiter 1 cm. longa, sparse appresse puberula. *Semina* circiter 2·5 mm. longa, conspicue punctata, villis circiter 5 mm. longis.—Mast. in Oliv. Fl. Trop. Afr., vol. i., p. 205; *H. gossypinus*, Mast. l.c. partim, non Thunb.

ERITREA. Keren, *Steudner* (no flowers on Kew specimen, hence determination uncertain). ABYSSINIA. Mt. Scholoda near Adowa, *Schimper*, Sect. ii., 646; Mt. Semejata, *Schimper*, Sect. ii., 936; Ouedjerate (Wojerat), *Quartin-Dillon & Petit*, 298; provinces of Tigre or Begemder, *Schimper*, 260 (ann. 1863–8);

Shoa (dedit *Franqueville* anno 1862); Ankober, *Roth*, 53; Alio Amba near Ankober, *Roth*, 150; Kambata, about 7° 30′ N., 38° E., nearly 1,800 m., *Wellby*; without precise locality, *Plowden*.

The single flower of Plowden's specimen examined had only 30 stamens, the lowermost whorl being absent.

One of the best characters of *H. crassinervius* is the shape of the bracteoles, which are distinctly broadened towards the apex. The bracteoles and calyx are much more densely clothed with stellate hairs than in *H. aponeurus*.

Hibiscus crassinervius, var. **minor**, *Sprague*; calycis lobis triangularibus staminibusque paucioribus a typo recedit.

Bracteolae 9–10, 3·5–5 mm. longae, superne parum dilatatae. *Calycis tubus* 2·5 mm. longus; lobi triangulares, acuminati, 2·5–3 mm. longi, basi 2–2·5 mm. lati. *Petala* 2 mm. adnata. *Stamina* 25, in verticillos tres disposita, quorum duo superiores decandri, infimus pentandrus. *Ovarii* loculi 5-ovulati.

ERITREA. Northern slope of Mt. Bizen, 1,700–1,800 m., *Schweinfurth & Riva*, 2053.

H. crassinervius var. *minor* has more the habit of *H. micranthus* than of *H. crassinervius*, but examination of the flowers leaves no doubt as to its true affinities. If the above-mentioned differences should prove to be constantly correlated, then var. *minor* would have to be raised to the rank of a subspecies.

913. **Hibiscus aponeurus**, *Sprague et Hutchinson* [Malvaceae-Hibisceae]; ab affini *H. crassinervio*, Hochst., bracteolis versus apicem haud dilatatis quam calyce manifeste brevioribus, calycis venatione et loborum forma recedit.

Frutex vel suffrutex, 0·3–1 m. altus, caule denudato ut ramis stricto dense aspere stellato-pubescente vel tomentello 2–4 mm. diametro. *Stipulae* subulatae, 3–6 mm. longae. *Folia* ovata vel elliptica (suprema interdum oblonga), apice rotundata vel obtusa, basi rotundata, 1·5–3·5 cm. longa, 1–3 cm. lata, serrulata, aspera, pilis stellatis supra pubescentia subtus tomentella vel pubescentia; petioli 2–10 mm. longi. *Flores* primum solitarii in axillis, denique ex iisdem axillis ramuli abbreviati circiter 2-flori orti. *Bracteolae* 9–10 (rarius 8), lineares vel lineari-subulatae, subacutae, 3·5–6·5 mm. longae, 0·4–0·75 mm. latae, basi vix connatae, extra pilis 2–4-radiatis, intus pilis simplicibus antrorse hirsutae. *Calyx* extra pilis 4–3-radiatis dense hirsutus, intus superne pilis antrorsis simplicibus vel biradiatis minute appresse pubescens inferne glaber; tubus 2–3 mm. longus; lobi lanceolati, subacuti, 4·5–9 mm. longi, basi 2–3·5 mm. lati, 3-nervii, et nervo medio et lateralibus conspicuis, vel sub-5-nervii, nervis submarginalibus inconspicuis additis. *Petala* oblongo-obovata, 1·6–1·7 cm. longa, 8–9 mm. lata, basi 3–4 mm. adnata. *Stamina* in forma typica 35, in verticillos quatuor disposita, quorum infimus pentandrus, 0·5–1·5 mm. supra petala insertus, ceteri decandri filamentellis geminatis; filamentella 1–2 mm. longa; columna tota 12–15 mm. longa, 1·5–2 mm. ultra verticillum supremum producta, dentibus 0·5 mm. longis. *Ovarium* 3·5–4·5 mm. longum, minute albotomentellum, loculis 5–7-ovulatis; styli glabri pars communis

6–10 mm. longa, ramis 3–9 mm. longis. *Capsula* 1–1·3 cm. longa, appresse puberula. *Semina* circiter 3·5 mm. longa, inconspicue punctata, villis circiter 5 mm. longis.—*H. crassinervius*, T. Thoms. in Speke, Journal of the Discovery of the Nile, p. 627 (App. G), non Hochst. *H. gossypinus*, Mast. in Oliv. Fl. Trop. Afr., vol. i., p. 205, *partim*, non Thunb. *H. gossypinus*, var., Oliv. in Trans. Linn. Soc., vol. xxix., p. 37, t. 14.

British East Africa. Near Nairobi, *Whyte*; between Kikuyu and the Eldama Ravine, *Whyte*; Ukamba, 1500–1800 m., *Scott Elliot*, 6497; Kiboss, *Linton*, 32; Kiu, *Linton*, 40: Makindu, *Linton*, 65: without precise locality, *C. F. Elliot*, 84, 137; Masai Country: Lykipia, 1800–2400 m., *Thomson*. Uganda. Koki District, *Dawe*, 350; Elgon District, *James*. German East Africa. Karagwe District. *Grant*, 215; Kilimanjaro, *C. S. Smith*.

Dawe, 350, has (in the single flower examined) five additional stamens, the three upper whorls being normal, and the lowest being replaced by eight solitary stamens and one pair arranged in two irregular whorls, thus bringing the total number of stamens to 40. *Linton*, 65, has practically the same staminal column. *Linton*, 32, has 45 stamens, in five whorls, of which the four upper consist of five pairs each, and the lowermost of five solitary stamens which alternate with the petals. In *Smith*, Kilimanjaro, on the other hand, the stamens are reduced in one flower to 30, and in another to 32, by the suppression respectively of all five and of three of the stamens of the lowermost whorl. All the other specimens quoted exhibit the typical arrangement of the staminal column.

Linton, 40, has abnormally large flowers: calyx-lobes 11–12 mm. long; petals nearly 2 cm. long, 11–12 mm. broad; staminal column 17 mm. long, the lowest whorl of stamens inserted 5 mm. above the petals; joint style 12 mm., branches 4 5 mm. long.

H. aponeurus is intermediate between *H. crassinervius* and *H. Hildebrandtii*, having the staminal column of the former, and bracteoles and calyx approaching those of the latter. In *H. crassinervius* the calyx lobes are three-nerved, and the lateral nerves of adjacent lobes unite just below the sinus and run down the calyx-tube as a single nerve, so that the tube is ten-nerved; in *H. aponeurus* the calyx lobes are likewise three-nerved, but often with an indication of two additional submarginal nerves, and the lateral nerves run down the calyx-tube parallel or approximating, only in rare instances uniting before reaching the base, so that the tube is fifteen-nerved.

914. **Hibiscus Wellbyi**, *Sprague* [Malvaceae-Hibisceae]; habitu *H. crassinervio*, Hochst. haud dissimilis, a quo tamen bracteolarum calycisque forma et indumento primo visu distinguitur.

Rami stricti, brunneo-stellato-pilosi, praesertim superne. *Folia* ovata, ut videtur subobtusa, 2·5–4.5 cm. longa, 2–3·5 cm. lata, basi rotundata, 5- vel sub-7-nervia, irregulariter serrata, pilis stellatis supra aspere pubescentia, subtus tomentella; petioli 0·5–1 cm. longi. *Pedunculi* 2·5–3 cm. longi, 5–8 mm. infra apices articulati, fructiferi 4 cm. longi. *Bracteolae* 10–11, lineari-subulatae, 5–7 mm. longae, 0·4–0·6 mm. latae, extra pilis magnis brunneis

biradiatis rarius triradiatis hirsutae, margine pilis simplicibus, intus inferne minute appresse pubescentes, superne pilis magnis brunneis simplicibus sparsissimis. *Calyx* extra pilis magnis brunneis 1–4-radiatis dense hirsutus, intus glaber lobis superne exceptis; tubus 3 mm. longus, 10-nervius, reticulatione manifesta; lobi e basi deltoidea subulati, 5–6·5 mm. longi, ima basi circiter 2 mm. lati. *Petala* anguste obovata, vix 2 cm. longa, 8–9 mm. lata, basi 3 mm. adnata. *Stamina* in verticillos quinque disposita, quorum quatuor superiores decandri filamentellis geminatis connatis; verticillus infimus e staminibus solitariis vel geminatis constans, paullo supra petala insertus; columna tota 1·2–1·3 cm. longa, 1·5 mm. supra verticillum supremum producta. *Ovarium* 3·5 mm. longum, loculis 6-ovulatis; styli pars communis 7 mm. longa, ramis 10–11 mm. longis, stigmatibus depresso-capitatis penicillatis circiter 0·5 mm. diametro.

ABYSSINIA. Between Harrar and Addi Abbaba, *Wellby*.

H. Wellbyi resembles *H. crassinervius* in the course of the main nerves of the calyx, but differs in the visible reticulation of the latter, and in having an additional whorl of stamens, as well as in the characters specified above.

915. **Hibiscus nyikensis**, *Sprague* [Malvaceae-Hibisceae]; affinis *H. Wellbyi*, Sprague, a quo foliorum et calycis loborum forma differt.

Innovationes et inflorescentiae dense brunneo-hirsutae. *Rami* adulti cinerei, basibus persistentibus pilorum punctulati, ramulis gracilibus. *Folia* oblonga vel oblongo-lanceolata, apice acuta vel obtusa, 1·5–5 cm. longa, 0·5–1·3 cm. lata, serrulata, basi obtusa vel rotundata, 5-nervia, utrinque aspere subtus densius pubescentia, venis media et lateralibus supra prominulis subtus prominentibus; petioli brunneo-hirsuti, 0·3–1 cm. longi. *Pedunculi* 0·7–2 cm. longi, 4–8 mm. infra apices articulati. *Bracteolae* 8–10, lineares, subobtusae, 3·5–6·5 mm. longae, 0·5–0·75 mm. latae, calycis lobos aequantes, extra pilis magnis brunneis 2–3-radiatis dense, intus sparse et marginibus pilis simplicibus hirsutae. *Calyx* extra pilis magnis brunneis 1–4-radiatis hirsutus, intus glaber apicibus loborum exceptis, manifeste reticulatus; tubus vix 2·5 mm. longus, irregulariter 15-nervius; lobi triangulares, 2·5–3·5 mm. longi, ima basi 2·5–2·75 mm. lati. *Petala* obovata, 1·7–1·8 cm. longa, 9–10 mm. lata, 2–2·5 mm. adnata. *Stamina* 50, in verticillos quinque decandros disposita, filamentellis geminatis connatis, infimis circ. 2 mm. longis, verticillo infimo circ. 2 mm. supra petala inserto; columna staminea 9 mm. longa, 1·5 mm. producta, dentibus lanceolatis 0·75 mm. longis. *Ovarium* 3 mm. longum, loculis 4–5-ovulatis; styli pars communis 4·5–6 mm. longa, ramis 4·5–5 mm. longis, stigmatibus vix 0·5 mm. diametro. *Capsula* (vix matura) circiter 1 cm. longa, appresse puberula.

NYASALAND. Nyika Plateau, 1800–2100 m., *Whyte*, 226; between Mpata and the commencement of the Tanganyika Plateau, 600–900 m., *Whyte*.

916. **Hibiscus Gossweileri**, *Sprague* [Malvaceae-Hibisceae]; habitu similis *H. micrantho*, Linn. f., sed potius affinis *H. crassinervio*, Hochst., a quo columna staminea et calycis laborum forma differt.

Caules satis graciles, pallide viridi-cinerei, pilis pluriradiatis majusculis brunneis subappressis conspicuis asperati. *Folia* ovata, apice acuta, basi obtuse cuneata vel subrotundata, 1·5–5 cm. longa, 1–2·5 cm. lata, serrata, utrinque aspera, supra puberula, subtus pubescentia, basi 5-nervia : petioli 0·5–1 cm. longi. *Pedunculi* circiter 1 cm. longi, paullo infra apices articulati, brunneo-hirsuti. *Bracteolae* 6–8, lineares, subacutae, superne haud vel vix dilatatae, 3–4·5 mm. longae, 0·5–1 mm. latae, extra dense, intus sparse antrorse hirsutae. *Calyx* extra pilis antrorsis dense hirsutus, magnis brunneis biradiatis praesertim in nervis sitis, minoribus pallidioribus numerosioribus interjectis ; tubus 2–2·5 mm. longus, 10-nervius vel sub-15-nervius, intus glaber ; lobi ovato-triangulares, obtusi, 3–3·5 mm. longi, basi 2–2·25 mm. lati, intus minutissime pubescentes. *Petala* obovata, circiter 1·5 cm. longa et 9 mm. lata, 2·5 mm. adnata. *Stamina* 30, in verticillos duo disposita, quorum superior icosandrus, staminibus per paria inserta, filamentellis usque ad basin liberis, inferior decandrus staminibus solitariis ; filamentella 6–7 mm. longa ; columna tota 6·5 mm. longa, supra verticillum superiorem 3 mm. producta ; verticillus superior 1 mm. supra inferiorem, inferior vix ·5 mm. supra petala insertus. *Ovarium* 2·5 mm. longum, loculis 4-ovulatis ; styli pars communis 6 mm. longa, ramis 5–7 mm. longis, stigmatibus circiter 0·5 mm. diametro. *Capsula* vix 1 cm. longa, minute puberula.

ANGOLA. District of Loanda, *Gossweiler*, 398.

One or two of the stamens of the lower whorl may be absent from their normal position and inserted along with adjoining stamens, so that we then have blank spaces and pairs instead of solitary stamens. The stamens of the lower whorl are normally opposite the pair of stamens of the upper whorl.

The nervation of the calyx varies slightly : the lateral nerves of adjacent lobes may either unite just below the sinus or may run down separately to the middle or to the base of the calyx-tube, so that the latter may have from ten to fifteen more or less distinct nerves.

917. **Balanites orbicularis**, *Sprague* [Simarubaceae] ; foliis sessilibus, foliolis sessilibus orbicularibus apiculatis ab affini *B. aegyptiaca* distincta.

Rami leviter flexuosi, striolati, dense pubescentes. *Spinae* axillares, sed ad latus secundi foliorum superiorum allatae, ita ut extra-axillares videntur, 2–4 cm. longae, folia et flores gerentia. *Folia* sessilia, 1-juga, apice subulato circiter 2 mm. longo ; foliola sessilia, orbicularia, 1·3–2 cm. diametro, acute apiculata, basi rotundata vel subcordata, utrinque pubescentia. *Cymae* in pseudofasciculos contractae, usque ad 5-florae. *Pedicelli* circiter 5 mm. longi. griseo-tomentelli. *Sepala* ovata, 4·5 mm. longa, 2·5–2·75 mm. lata, extra tomentella, intus sericeo-villosa. *Petala* oblonga obtusa, a medio versus basin angustata, 6–7 mm. longa, 2–2·5 mm. lata. *Filamenta* 3·5 mm. longa, antheris 1·5 mm. longis. *Discus* 2 mm. altus. *Ovarium* vix 1·5 mm. diametro, tomentosum, circiter 1 mm. in disco immersum.

BRITISH SOMALILAND. *Drake-Brockman*, 336, 337.

An interesting feature of *B. orbicularis* is that the branches are carried up the stem through two internodes above the leaf in whose axil they arise, so that they appear to arise at the side of the second leaf above.

918. **Malacantha obtusa**, *C. H. Wright* [Sapotaceae]; *M. alnifoliae*, Pierre, proxima, foliis basi truncatis recedit.

Rami juniores dense rufo-villosi, robusti, vetustiores glabri, lenticillati. *Folia* obovata, obtusa vel brevissime cuspidata, basi obtusa, 20 cm. longa, 12 cm. lata, utrinque primum pubescentia, supra demum fere glabrescentia; nervi utrinque circa 20, supra impressi, subtus prominentes; petiolus 8 mm. longus, crassus, dense villosus. *Flores* ad axin paniculae ramorum dense fasciculatim congesti. *Sepala* extus dense pubescentia, imbricata, elliptica, duo exteriora 5 mm. longa, 3·5 mm. lata, crassa, valide nervata, tria interiora paullo majora, tenuiora. *Corollae* tubus 4 mm. longus, 3 mm. diametro; lobi patentes, elliptici, obtusi, 3 mm. longi, 2·5 mm. lati, breviter ciliati. *Stamina* breviter exserta; filamenta ad corollae faucem affixa, subulata; antherae dorsifixae, 2 mm. longae. *Ovarium* ovoideum, dense hirsutum; stylus columnaris; stigmatis lobi 5, globosi. *Fructus* ellipticus, 2 cm. longus, 1·4 cm. diametro, 1-spermus. *Semen* ellipticum, lateraliter affixum, hilo albido excepto castaneum, exalbuminosum; cotyledones crassae, plano-convexae.

Western Tropical Africa. Lagos, *Foster*, 37.

919. **Faurea racemosa**, *Farmar* [Proteaceae]; affinis *F. forficuliflorae*, Baker, sed foliis a medio ad apicem sensim attenuatis, inflorescentia rufo-pubescente, floribus minoribus, squamis hypogynsi bifidis, villis ovarii multo longioribus et stylo sub apice haud torto multo breviore distincta.

Ramuli dense foliati. *Folia* lanceolata, a medio ad apicem acutum attenuata, basi acuta, 7–10 cm. longa, 2–3 cm. lata, glabra, coriacea, supra nitidula; petiolus 3–7 mm. longus, gracilis. *Racemi* densiflori, circa 11 cm. longi, 3 cm diametro; rachis ferrugineo-pubescens; pedicelli patuli, ferrugineo-pilosi, circa 4 mm. longi; bracteae minutae, deltoideae, apiculatae. *Perigonium* brunneum, glabrum, circa 13 mm. longum ad basin ad 2 mm. latum. *Antherae* 2·5 mm. longae; filamenta ad 2 mm. longa. *Squamae* hypogynae 1 mm. longae, triangulares, apice breviter acute, bifidae. *Stylus* 12 mm. longus, leviter recurvus, sub apice haud tortus; ovarii villi ad 7 mm. longi.

Africa. Mount Milanji, Nyassaland at about 2000 m., *G. Adamson*, 338.

920. **Panicum** (§ **Echinochloa**) **haplocladum** *Stapf* [Gramineae-Paniceae]; *P. cruri-pavonis* affinis sed paniculae ramis simplicibus, spiculis minoribus omnibus vel saltem interioribus breviter vel brevissime aristatis.

Gramen perenne, dense caespitosum. *Culmi* erecti, ultra 1·5 m. alti, inferne compressi, caeterum teretes, ad 5 mm. crassi, plerumque circiter 5-nodi, nodis superioribus breviter exsertis. *Folia* plerumque glaberrima, raro ad vaginas vel laminas hirsuta; vaginae basales compressae, carinatae, omnes laeves, leviter striatae; ligula nulla, saepe linea pilorum vel zona pubescente

substituta; laminae lineares, longissime attenuatae, basi brevissime vel vix rotundato-contractae, 30–50 cm. longae, 5-10 mm. latae, planae, saepe firmulae, ad margines asperae, caeterum plerumque laeves, costa tenui. *Panicula* erecta, lineari-oblonga vel elongato-pyramidalis, 10–16 cm. longa, 3–5 (raro basi ad 7) cm. lata, densa; axis subgracilis, profunde sulcato-striata, superne triquetra, ad angulos scabra, ad nodos pilis longis rigidis paucis vel interdum numerosis obsita; rami numerosi, quam internodia multi longiores, inferiores plerumque 2–3-natim approximati, 1–3 cm. longi, stricti vel interdum flexuosi, ab ima basi spiculigeri, axi gracili pubescente interdum setis hincinde additis; pedicelli brevissimi, geminati vel ternatim fasciculati. *Spiculae* secundae, 3–4-seriatae, congestae, ovoideae, caudato-acuminatae, serierum exteriorum interdum longius aristatae, 2–3 mm. longae, luride virides vel purpurascentes; *Gluma* inferior latissime ovata, minute apiculata vel mucronulata, 3–5-nervis, scaberula, superior late ovata, cuspidato-acuminata, longitudine spiculae, 5-nervis, inter nervos superne spinuloso-scabros magis minusve pubescens. *Anthoecium inferum* ♂; valva glumae superiori similis nisi dorso applanata, acumine saepe in aristam brevem tenuem ad 5 mm. longam (rarissime longiorem) abeunte; palea valvam aequans late oblonga, carinis superne subasperulis. *Anthoecium superum* ♀, ambitu ovatum vel ellipticum, apiculatum, fere longitudine spiculae, albidum, nitidum; valva crustacea, 5-nervis. *Antherae* 1 mm. longae.

BRITISH EAST AFRICA. Near Mombasa, in temporarily flooded localities, *Hildebrandt*, 1954–2022. Kikumbuliu Hills, *Scott Elliot*, 6291; Maji Chumoi, *Kässner*, 455; Baringo Marsh, *H. H. Johnston*. GERMAN EAST AFRICA. Turu, in boggy places, *Speke & Grant*. Rovuma River, *Meller*.

Speke and Grant observed a form having leaves marked with dark brown or black cross bars. Scott Elliot's and Johnston's specimens have practically no awns.

X.—JEQUIÉ MANIÇOBA AND ITS ALLIES.

(*Manihot dichotoma*, Ule and other species).

The first intimation to reach Kew of the existence of rubber-yielding plants closely related to the commonly cultivated *Manihot Glaziovii* took place in the early part of 1906. Mr. J. A. Davy, manager of the Dumont Coffee Company, Ribeirão Preto, São Paulo, Brazil, called at the Gardens in March and left some seeds of the Jequié or Jiquié Manihot. On his return to Brazil he sent us a supply of seeds together with the following information:—"at present we have two kinds of rubber trees growing here, the Manihot Glaziovii or Common Ceará Maniçoba, and the other Manihot Jequié, which is a native of the state of Bahia." In a subsequent letter (dated June 30th, 1906) Mr. Davy writes:—"as regards the Jequié variety of Manihots, this plant originates in the municipality of Jequié, State of Bahia, and is at present looked upon as a better latex producer than the Manihot

Glaziovii or Ceará. I am sending you the seed of this plant and eventually will forward some dried herbarium specimens. We have at present about 3,000 young sturdy Jequié plants growing. In appearance they are similar to the Ceará except that the ribs of the leaves have a red tinge while those of the Ceará are whitish. Again, in itself, the Jequié shows differences in the form of the foliage of the young plants, which you will understand when I forward the dried specimens."

Unfortunately no flowering specimens have as yet reached Kew from Mr. Davy, but that they are very necessary will be clear from the letter of our next correspondent on the subject.

In October, 1906, Mr. J. P. Rowe (since deceased) of Messrs. Anderson and Rowe, Bahia, wrote for information as to the tree which yielded Maniçoba rubber, and later presented a large consignment of seeds, which appeared to be identical with those sent by Mr. Davy. At the same time the following particulars were furnished by Mr. Rowe :—

"I have much pleasure in sending you particulars of the different varieties of Maniçoba rubber trees which are found in great numbers in the district of Jequié.

"According to my agent in that district, who has studied the subject there for three years, there are seven varieties which he has examined. In my opinion, however, there are more.

"Of the seven varieties my agent has selected for cultivation and is planting largely two which vary but very slightly, both being of most vigorous growth, developing very quickly flowering and seeding at an early age, with bark very smooth, soft, and easy to tap.

"Of one (A) called by the natives 'Maniçoba blanca' (white Maniçoba) the leaves (three-lobed) are pale green on the under surface with ribs of greenish-white, the contrast of the ribs with the leaf being sufficiently well marked to enable this variety to be identified at a glance by the natives, who have only to stand beneath the tree and look upwards through the foliage to distinguish the species with certainty. The latex is pure white, flows freely, and coagulates immediately without the use of any agent.

"The seeds you have sown at Kew ought to be all of this variety.

"Of the other (B) the ribs of the leaves on the under side are of a purplish colour, the leaf itself being of a darker hue than the 'white' Maniçoba. This variety is called by the natives 'Maniçoba rouxa' (purple). It is as vigorous in growth as the 'white' variety, and the latex is equally white and flows and coagulates as readily.

"A third variety (C) also grows vigorously in cultivation, being while still young very similar to those before mentioned, but as it increases in age the bark, which is silvery, hardens, roughens, and peels off in flakes like that of the birch. The latex is white and coagulates readily.

"Two other varieties (D and E) have also rough barks, but marked with small brownish patches. These have not been cultivated by us, as the bark is harder to cut, and the flow of latex is scanty.

"In addition to the foregoing species there are two others, both inferior, for the reasons that the latex, which is pale green in colour, is scanty, and when coagulated the rubber contains a high percentage of resin.

"Of the 'A' and 'B' varieties we have cultivated trees the trunks of which at 14 months old were 4 inches in diameter at 3 feet from the ground, and 10 feet high. Some of these young trees were flowering and seeding at that age.

"Our plantations are mostly formed of young seedlings taken from the forests, which contain vast numbers. They are transplanted 1,000 to the acre, and do not appear to be too crowded. The transplantation causes no apparent set-back, and the close planting has a good effect in keeping down the scrub undergrowth. At three years old cultivated trees of the two first-mentioned varieties have yielded 7 ounces of dry rubber on the average."

A further supply of "Maniçoba seeds" was received from Mr. H. Stevenson, H.B.M.'s Acting Consul at Bahia, and reached Kew in March, 1907.

These seeds, as well as plants raised from the seeds sent by Mr. Rowe, have been distributed to the botanical stations and gardens of India and the Colonies.

The following table shows the distribution of the plants raised at Kew, and sent out in Wardian cases on May 23rd, 1907 :—

No. of Plants.	Destination.	Condition on Arrival.
200	Calcutta ... —	"Good."
100	Ceylon	"Excellent."
100	Singapore	"Good."
100	Java	No information.
50	Fiji	
50	Brisbane...	
50	Penang	"Excellent, all living."
50	Kuala Lumpur...	No comments.
50	Bangalore	
50	Hongkong	"Splendid."

Two plants were also sent to British Central Africa, and one plant to N.W. Rhodesia with other plants. In addition to the plants, seeds, received from Mr. Stevenson, were sent to Calcutta, Ceylon, Kuala Lumpur, Singapore, and Brisbane.

In consequence of this last consignment of seeds a correspondence was opened with Mr. O'Sullivan Beare, H.B.M.'s Consul at Bahia, on the subject. He has supplied much information which is incorporated in the Diplomatic and Consular Report on the trade of Bahia for the years 1904–1906 issued in August, 1907. The following extract is taken from this report :—

"The export of rubber from the State of Bahia has increased more than tenfold within the past six years, having risen from 100 tons in 1900 to over 1,100 tons in 1906.

"Of the total quantity of rubber exported annually from Bahia, the greater proportion has hitherto been of low grade, consisting mainly of a variety known as 'Mangabeira' rubber, which comes

from the adjoining States of Minas Geraes and Piauhy. But it has lately been discovered that the State of Bahia is very rich in a rubber-producing tree, locally known as 'Jiquié Maniçoba.' The tree in question is a new and distinct species of Manihot, which apparently is peculiar to the State of Bahia.

"The discovery is a matter of much importance not only for this State but also for the rubber trade in general, inasmuch as the rubber obtainable from the Jiquié Maniçoba, when properly prepared, would seem to be equal in quality to the best product of the Pará region.

"This matter of Jiquié rubber appears to be of so much interest, and there exists so much misunderstanding with respect to it, that I may be excused for giving here some particulars concerning the tree from which the rubber in question is derived.

"The Maniçoba of Bahia is a tree which attains to a height of 30 feet and upwards, with a diameter of some 2 feet, when fully matured in suitable soil.

"It belongs to the family of *Euphorbiaceae* as does also the *Hevea brasiliensis* which produces Pará rubber, yet it is closely akin to Manihot, aipins or macacheiras, mamomeiras, Seringueiras, &c. Its zone, so far as is at present known, extends from Maranhão to the southern borders of the State of Bahia. It flourishes throughout the 'Sertão'* within the limits specified, but is found in greatest abundance in the regions adjoining the town of Jiquié, whence its local name.

"The Jiquié Maniçoba is undoubtedly a new and distinct species of Manihot, and it must not be confounded with the Manihot of Ceará (*Manihot Glaziovii*, Muell. Arg.). The seeds of Jiquié Maniçoba are much larger than those of the Maniçoba of Ceará.

"The season for extracting the latex from the Jiquié Maniçoba extends from August to March. The latex possesses the valuable property of coagulating spontaneously when exposed to the air, and it requires no acid or other artificial coagulant of any kind.

"It has been found, from experiment, that the Jiquié Maniçoba tree can be made to yield its latex between the fourth and fifth years from time of first planting; but the tree yields its maximum returns from the age of eight years onwards.

"The planters of Bahia have awakened to the fact that in the cultivation of Jiquié Maniçoba they possess a source of much potential wealth. Already several fazendeiros have begun to lay down plantations of the tree in question upon a large scale. The two most extensive of those plantations are situated one upon the Island of Joannes, close to the city of San Salvador, the other in the district of Machado Portella. The Agricultural Institute, which has recently been established by the State, proposes to devote special attention to the systematic cultivation of Jiquié Maniçoba, and to the preparation of rubber derivable therefrom.

"A planter established in the Jiquié district recently prepared a considerable quantity of rubber obtained from Maniçoba trees

* "Sertão," a term applied to vast spaces in the interior of Brazil, covered with brushwood and diversified by great tracts of forest.

growing wild in that neighbourhood, and despatched it to New York. The consignment was classified in the New York market as being equal to the best Pará rubber, and it fetched 1 dol. 20 c. (5s.) per lb."

In answer to a further request for botanical specimens of the Jequié Maniçoba the following letter was received at Kew :—

H.M.'s Consul, Bahia, to Royal Botanic Gardens, Kew.

H.B.M.'s Consulate, Bahia,
4th September, 1907.

Dear Sir,

With reference to your letter of 11th July last requesting further information respecting Maniçoba, I have just learned that a German botanist, Professor Ule, who recently visited the States of Bahia and Piauhy for the purpose of collecting specimens of the rubber-producing plants which grow in those two States, has decided, after having conferred with his colleagues at Berlin respecting the matter in question, that the three species of Maniçoba which grow in the States of Bahia and Piauhy all differ essentially from *Manihot Glaziovii*, of Ceará.

The German botanists have decided to distinguish the three species of Maniçoba found growing in the States of Bahia and Piauhy by the following designations, viz. :—

So-called Jiquié Maniçoba = *Manihot dichotoma* ;
„ S. Francisco Maniçoba = *Manihot heptaphylla* ;
„ Piauhy Maniçoba = *Manihot piauhyensis*.

As regards the name "Maniçoba," it would appear to be a generic term applied, locally, to all species of Manihot which yield rubber.

I am, &c.,

(Signed) D. R. O'Sullivan-Beare,
H.B.M.'s Consul.

On the 20th of September Mr. O'Sullivan-Beare wrote again, promising herbarium material, and sending two samples of rubber, namely, a sample of so-called Jiquié rubber (obtained from *Manihot dichotoma*), and a sample of so-called Rio Sâo Francisco rubber (obtained from *Manihot heptaphylla*). These are now in Museum No. 1, and are both rubbers of good quality.

The young plants raised from the seeds sent by Messrs. Davy, Rowe, and Stevenson appear to be all similar. The seeds germinated very readily, and the plants, now some nine months old, are characterised by the somewhat thickened lower portion of the stem. In the shedding of the bark these plants differ from *Manihot Glaziovii*, since longitudinal slits are formed, and the membranous bark peels off in more or less vertical rows ; the leaves of the young plants appear to have had greenish-white veins in all cases, thus differing from Davy's plants grown in Brazil, but this may be due to the artificial conditions of cultivation.

Other attempts to obtain material which would have enabled the question of these Maniçobas to have been solved at Kew have proved in vain, and the following extract from a letter from

Senor J. Limão da Costa helps to show the difficulties besetting the subject :—

"The Maniçoba of Jequié is a variety of that plant existing in Ceará and in this State, in the San Francisco region. Absolutely different to that is the species named Jequié (locality where it abounds in a wild state), as it presents various specimens [? considerable variation] in the trees from which latex is extracted. The trees commonly known as Jequié Maniçoba abound mostly in the municipalities of Maracá, Pocoes, Conquista, &c."

In Mr. O'Sullivan-Beare's letter to Kew of September 4th, 1907, already quoted, reference is made to Professor Ule's visit to the States of Bahia and Piauhy for the purpose of investigating the sources of Maniçoba. His results have recently been published in *Notizblatt des Königl. botanischen Gartens und Museums zu Berlin, Dahlem*, No. 41 (Bd. V.), of November 27th, 1907, where diagnoses of the three new species of *Manihot* are given, and a further and more detailed account of these newly discovered sources of rubber has appeared in *Der Tropenpflanzer* No. 12, for December, 1907.

From the Consular Report on the trade of Bahia, quoted above, it seems probable that these species are likely to be of considerable importance, and the following account has therefore been compiled from the information contained in these papers. Dr. Ule undertook two journeys into the States of Bahia and Piauhy under the auspices of the Bahia Rubber Syndicate of Leipsic in the year 1906. In the interior two distinct and nearly related rubber yielding species of Maniçoba were found, the one growing on the mountains of the right bank of the Rio San Francisco, and the other, confined to the country at some distance from the left bank, occurring especially in the adjoining State of Piauhy. The latter appears to be the better species. One species was discovered in the wooded steppes of the Serra do San Ignazio growing in places where the Mangabeira (*Hancornia speciosa*) also flourishes. This Maniçoba, however, grows rather on the rocky country (Felsenformation), and is thus a true mountain plant.

The three species of Manihot are described under the names *M. dichotoma*, *M. heptaphylla*, and *M. piauhyensis*, and the following diagnoses are taken from Dr. Ule's paper :—

Manihot dichotoma, Ule.

Petioli limbum aequantes, limbus 3–5 partitus, membranaceus ; laciniae obovatae, integrae vel ± late sinuatae, glabrae ; racemi subpauciflori ; bracteae margine denticulatae, quam flores breviores, caducae ; flores intus extusque glabri ; capsulae ellipsoideae, breviter alato-6-costae ; semina ellipsoidea.

M. heptaphylla, Ule.

Petioli limbum fere aequantes, limbus profunde 7-, raro 5-partitus ; laciniae oblanceolatae, leviter vel altius lyrato-constrictae, coriaceo-membranaceae ; racemi densiflori, macranthi ; bracteae flores superantes, integrae ; flores extus intusque glabri ; capsulae subglobosae, exalatae, leviter 6-angulosae acutae.

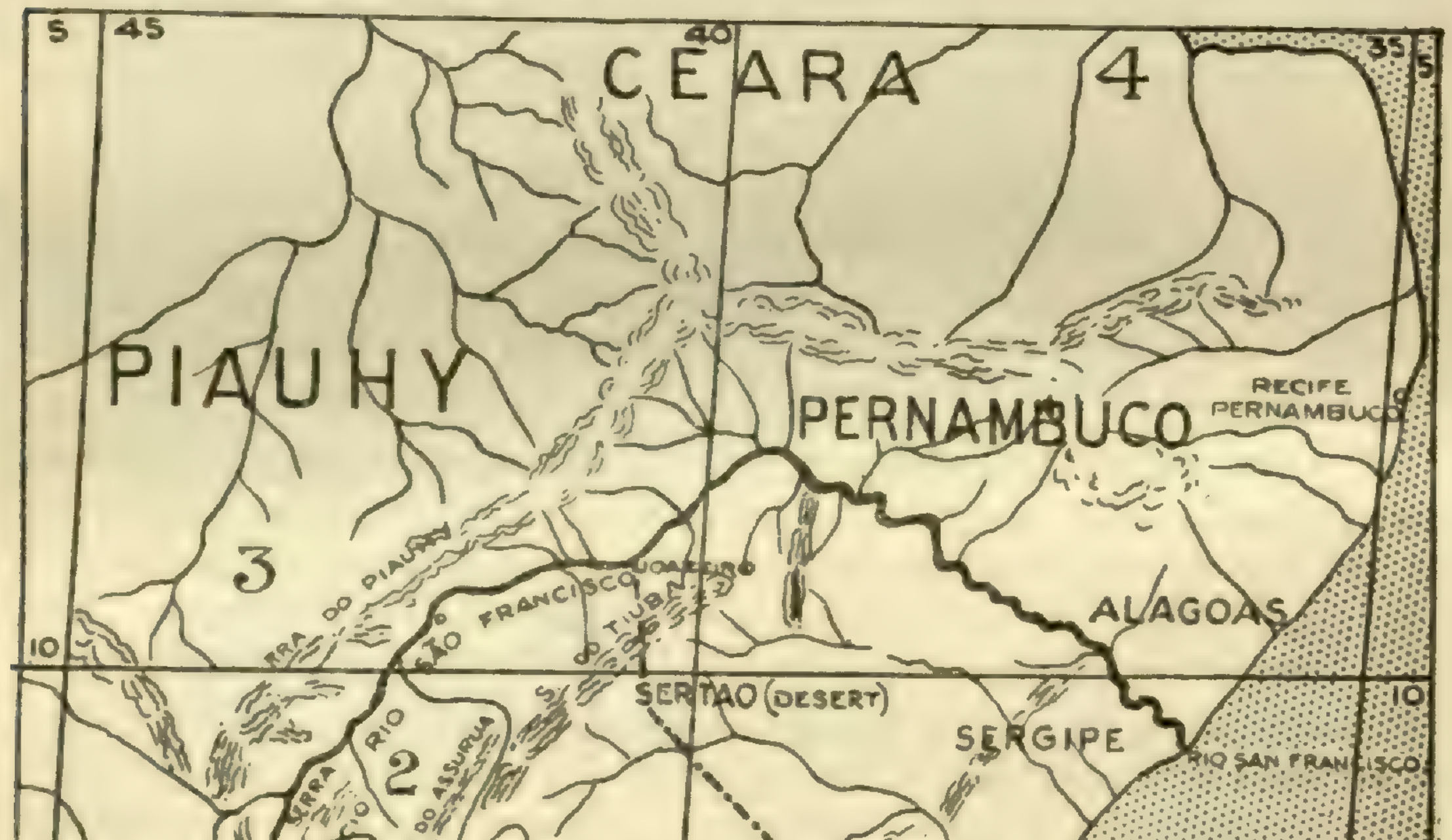
M. piauhyensis, Ule.

Petioli limbum fere aequantes, limbus profunde 5-partitus ; laciniae late obovatae vel oblongo-obovatae, apice rotundatae,

coriaceo-membranaceae ; racemi elongati, macranthi ; bracteae flores superantes, integrae ; flores extus intusque glabri ; capsulae subglobosae, acutiusculae, manifeste subalato-costatae.

Manihot dichotoma does not form quite so large a tree as Ceará *M. Glaziovii*, and is from 5–12 metres (16–39 feet) in height, at the same time the growth of the crown is much more compact and for the most part densely dichotomously branched. The stem also does not become so thick and the bark is thinner and usually paler, though a variety with a darker bark is known. The leaves of *M. dichotoma* are 3–5-partite—it is only in the seedlings that they are somewhat peltate—they are also much smaller than those of *M. Glaziovii*. The smaller leaves and the large, long seeds afford the most important characters for distinguishing this species from *M. Glaziovii*.

M. dichotoma is confined to the south-east of the State of Bahia from 12·5°–14·5° S. lat., where it extends from the region of the middle Rio Paraguassu to the middle course of the Rio das Contas. It derives its name of Jequié Maniçoba from the small town of Jequie in that locality, which serves as the centre of the rubber trade as regards this plant.



Sketch map of a portion of N.E. Brazil to show the distribution of the newly discovered Maniçobas.

1. Region of *M. dichotoma*.
2. Region of *M. heptaphylla*.
3. Region of *M. piauhyensis*.
4. Region of *M. Glaziovii*.

—·— Railway from Bahia to Joazeiro on the Rio São Francisco.

It grows in the true "catinga,"* being found especially on the mountain slopes, which might be called "mountain catinga." It avoids the more park-like situations, where isolated and somewhat larger trees are more prominent and prefers a rather denser woody "catinga." The tree thrives best on red, loamy soil, and is found more rarely on sandy soil. Some miles from Porto Alegre, on the Rio das Contas, the mountain slopes have been seen by Ule so well covered by these trees that they constituted nearly 50 per cent. of the forest.

It seems probable, however, that the wild supply will soon be exhausted.

Manihot heptaphylla and **M. piauhyensis**, whose rubber is exported principally along the Rio San Francisco, are quite different in habit from *M. dichotoma*. They both form low trees with short stems, and their broad and densely leafy crowns are forked two or three times.

M. heptaphylla is 3–8 metres (9–26 feet) in height with blackish-brown bark and beautiful purple twigs; the leaf lamina is usually 7-partite and dark green; the seeds are roundish as in *M. Glaziovii* but larger and paler than in that species.

It occurs exclusively on the right bank of the Rio San Francisco, from 9·5°–12·5° S. lat., especially in the mountainous districts of the Serra do Encaibro, Serra do Tombador, Serra do Assuruá, etc.

It has been observed in the wild state only in a restricted area near the village of Chique-chique in the Serra do San Ignazio, where it grows with other trees amongst the sandstone rocks. Sometimes it is found in company with Mangabeira.

M. piauhyensis is closely allied to *M. heptaphylla*, but forms somewhat smaller trees from 2–5 metres (6–16 feet) in height; it differs in having 5-partite leaves with broader tips. The racemes also are longer and the fruits are winged at the corners. The seeds can scarcely be distinguished from those of *M. piauhyensis*.

The locality for this species extends from the region to the south-east of the State of Piauhy along the boundary of Bahia from about 8°–10° S. lat. It grows in the rather lower sandstone mountain ranges, which stretch southwards from Ceará. In this region the trees of *M. piauhyensis* cover a wide area and are distinguished by their fresh vivid green from the low trees with which they are intermingled.

Isolated examples may be seen among the rocks, and the trees appear to succeed best on a sandy soil. This species often shoots up in abundance in places where the forest has been recently destroyed by fire.

Collection of Rubber.—The mode of collection of the rubber from these three species differs from that in use for *M. Glaziovii*, owing to the differences in the habit of growth and the nature of the barks of these trees.

* Catinga is a term used to denote small woods, consisting of trees of small and medium size, in the Brazilian Savanahs.

In *Manihot dichotoma* the stem is cut in a wavy line by means of a knife, which is curved or rounded at the apex, and a small metal cup is placed at the end of the cut to collect the latex. The latex begins to coagulate as soon as collected, and it is then pressed by hand into balls, which are afterwards usually compressed in cylinders and then well dried. With careful methods a tree may be tapped from three to ten times. The rubber obtained annually at the present time from the wild growth of *M. dichotoma* may be reckoned at 400 to 500 tonnes.* In this calculation plantations do not yet come into consideration, since the discovery of this tree was only made in 1901 and the trees first planted are only just becoming ready for tapping.

The method of obtaining the rubber from the two other species is nearly identical, but differs from that described for *M. dichotoma* owing to their short stems and the somewhat harder nature of the bark. A cut just above the root has proved to be most effective, and for this purpose a small hole is dug on one side of the stem and lined with clay ; scratches are then made just above the neck of the root and the latex flows into the little pit where it coagulates and is collected one or two days later.

A cake of from 10–100 grammes may be obtained from a single tapping.

M. heptaphylla yields about 500 tonnes of rubber per year, whilst for *M. piauhyensis* the output of rubber is estimated at at least 600 tonnes in the year.

Plantations.—At present the plantations of *M. dichotoma* are rather young and only the oldest are ready for tapping ; but from the two other species, which have been known longer, a satisfactory amount of rubber is now being brought on to the market. In the plantations, which are laid out in a quite primitive manner, the seeds are planted in rows two metres apart, making 2,500 trees to the hectare (2·47 acres). Other plants may be grown between the rows during the first year. With regard to tapping, *M. piauhyensis* is ready in the third year and the other two species may be tapped in their fourth year of growth. The yield of rubber from a single tree of *M. dichotoma* in one year can be reckoned at from 100–200 grammes with present methods, and this is equivalent to 200–300 kilogs. per hectare.

The annual yield of rubber for single trees of *M. piauhyensis* and *M. heptaphylla* is from 500–1000 grammes, which corresponds roughly to about 1 tonne per hectare.

Value of the Rubber.—The market value of the three kinds of rubber, according to the rate of October 28th last, was for

M. heptaphylla	...	6*s.*–6*s.* 6*d.* per kilo.
M. piauhyensis	...	7*s.* 6*d.* per kilo.
M. dichotoma	...	8*s.*–8*s.* 6d. per kilo.

Para rubber being quoted at 9*s.* per kilo.

The cultivation of Ceara rubber (*M. Glaziovii*), which has been pursued with more or less profit in many cases, has had to be

* 1 tonne (1,000 kilog.) = ·934 of a ton.

given up in some places owing to its failure to pay, due partly to the injury caused by wind and by careless tapping, and also to the hardness of its bark.

The advantage of the three species from Bahia and Piauhy is that they are less liable to the injuries just mentioned and that, speaking generally, the yield of rubber is far higher than in *M. Glaziovii*. One hectare planted with *M. Glaziovii* is estimated to yield 300 kilos, whilst 1000 kilos per hectare is the amount reckoned for *M. piauhyensis* or *M. heptaphylla* when planted in suitable positions. Such a yield exceeds even that of *Hevea brasiliensis*.

As to the relative values of *M. piauhyensis* and *M. heptaphylla*, the former yields a slightly more valuable rubber, and the tree is ready for tapping somewhat earlier. On the other hand, the latter appears to be a longer-lived tree.

Comparing the Maniçoba plants with *Hevea*, Ule remarks that there is no doubt that the rubber of *H. brasiliensis* is of better quality, possesses greater elasticity and obtains the higher price, but in spite of this the characteristics of these Manihots make them well worthy of cultivation.

Conclusions.—One of the conclusions drawn by Ule, from the facts set out, is that wherever conditions are suitable the cultivation of *M. Glaziovii* will have to be replaced by that of the Maniçobas from Bahia. The question as to which of the three species is to be preferred depends chiefly on the nature of the soil, since they grow under nearly similar climatic conditions.

In a rather firm, loamy soil *M. dichotoma* is the most suitable species, whilst *M. heptaphylla* and *M. piauhyensis* should be planted in a light sandy soil. *M. dichotoma* has the advantage over the other two species in that its seeds germinate especially easily.

Hevea brasiliensis is obviously the most important plant for luxuriant tropical regions, whilst *M. heptaphylla* and *M. piauhyensis* must be regarded as the rubber plants of the future for dry and less fertile districts.

Dr. Ule promises further details, together with a map and five plates in the next number of "*Notizblatt*."* The rough outline map included in this article is added for the convenience of the reader.

XI.—NEW ORCHIDS: DECADE 31.

301. **Liparis tabularis**, *Rolfe* ; species insignis, a *L. macrantha*, Rolfe, labello orbiculari obtuso et venis regulariter flabellatis differt.

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* Dr. Ule's full paper in *Notizblatt*, No. 41A, Bd. V., of January 25th, 1908, has come to hand while this article is in the press. A map and photographs of the three Manihots are given, as well as drawings of the leaves, flowers, fruits, and seeds.

Pseudobulbi anguste conici, 8–10 cm. longi, circa 2 cm. lati, vaginis membranaceis albidis venosis imbricatis tecti. *Folia* membranacea, ovato-elliptica, breviter acuminata, undulata, plicata, 10–12 cm. longa, 4–5 cm. lata ; petioli dilatati, in vaginis imbricatis spathaceo-oblongis acutis carinatis et striatis inclusi. *Scapus* erectus, acute 5-angulatus, purpureus, circa 15 cm. altus ; racemus laxus. *Bracteae* triangulari-subulatae, acutae, 2 mm. longae. *Pedicelli* angulati, purpurei, 1·5 cm. longi. *Flores* magni, purpurei. *Sepalum* posticum oblongo - lanceolatum, acutum, 1·5 cm. longum ; sepala lateralia oblonga, acuta, circa 1·2 cm. longa, marginibus revolutis. *Petala* filiformia, 1·5 cm. longa. *Labellum* orbiculare, crebre denticulatum, leviter recurvum, 1·5–1·7 cm. latum, ima basi callosum. *Columna* clavata, incurva, 8 mm. longa.

PENANG. *Curtis.*

Sent to Mr. H. A. Tracy, of Twickenham, by Mr. C. Curtis, of the Forest Department, Penang, and flowered in the collection of Mr. H. T. Pitt, Rosslyn, Stamford Hill, in April, 1906. It flowered at Kew in June of the following year, when a drawing was made for the *Botanical Magazine.*

302. **Liparis Warpuri**, *Rolfe* ; a *L. parva*, Ridl., floribus majusculis, labello crenulato differt.

Herba caespitosa, pusilla. *Caules* approximati, carnosuli, 2–3 cm. longi, monophylli, vaginis imbricatis puncticulatis obtecti. *Folia* sessilia, anguste ovata, acuta, subconduplicata, supra glaucescentia, 3–4·5 cm. longa, circa 1 cm. lata. *Scapi* graciles, 4–6 cm. longi, apice 2–1-flori. *Bracteae* sessiles, cordatae, acuminatae, 7–8 mm. longae, 3–4 mm. latae. *Pedicelli* 1–1·3 cm. longi. *Flores* majusculi, virides. *Sepalum* posticum lineare, circa 1·8 cm. longum, marginibus revolutis ; sepala lateralia falcato-oblonga, obtusa, 1·5 cm. longa. *Petala* deflexa, filiformia, circa 1·4 cm. longa. *Labellum* recurvum, breviter unguiculatum, obovatum, denticulatum, circa 1·2 cm. longum, 1 cm. latum ; discus carnosus, minute verrucosus, ad basin callo bicornuto parvo instructus. *Columna* incurva, 6–7 mm. longa, alis parvis obtusis.

MADAGASCAR. *Warpur.*

A curious little plant, introduced about seven years ago, which has flowered several times in the Kew collection, and never exceeds a few inches high. The flowers are few and large for the size of the plant, light green, with a dark green disc to the lip.

303. **Cirrhopetalum fascinator**, *Rolfe* ; a *C. appendiculato*, Rolfe, floribus multo majoribus, segmentorum appendicibus linearibus nec foliaceis differt.

Herba epiphytica. *Rhizoma* repens, validum. *Pseudobulbi* breviter tetragono-oblongi, nitidi, 1·5–2·5 cm. longi, 1–2 cm. lati, monophylli. *Folia* sessilia, coriacea, elliptico-oblonga, obtusa, 2–7 cm. longa, 1·5–3 cm. lata. *Scapi* patentes, circa 10 cm. longi, uniflori. *Bracteae* spathaceae, apice acutae, 1 cm. longae. *Flores* magni, pallide virides, purpureo-punctati et ornati. *Sepalum* posticum ovatum, acuminatum, 2·5–3 cm. longum, supra medium

ciliatum et appendicibus filiformibus amethystino-purpureis ornatum ; sepala lateralia connata, oblongo-lanceolata, longissime caudato-acuminata, 13–18 cm. longa, basi coriacea, crebre verrucosa, marginibus revolutis. *Petala* falcato-oblonga, subacuta, circa 2 cm. longa, margine et apice appendicibus filiformibus amethystino-purpureis ornata. *Labellum* recurvum, ovato-oblongum, subobtusum, canaliculatum, bicarinatum, carinis et marginibus puberulis. *Columna* lata, 8 mm. longa, marginibus acutis, alis latis tridentatis.

ANNAM. Attopen, *Micholitz*.

Introduced by Messrs. Sander & Sons, from whom it was received in 1905, and flowered at Kew in September, 1907. The ground colour of the flowers is light green, and the markings dull purple, these consisting of five stripes and a few spots on the dorsal sepal, and numerous minute dots on the column and on the base of the petals, while the lip and sides of the lateral sepals are suffused with the same colour. The remarkable appendages on the petals and dorsal sepal are amethyst-purple in colour.

304. **Cirrhopetalum papillosum**, *Rolfe* ; a *C. retusiusculo*, Reichb. f., et omnibus speciebus generis mihi notis, sepalis lateralibus papilloso-hispidis facile distinguendum.

Rhizoma breve. *Pseudobulbi* approximati, anguste elliptico-oblongi, 2 cm. longi, circa 8 mm. lati, monophylli. *Folia* anguste oblonga, subobtusa, coriacea, circa 4 cm. longa, 7–8 mm. lata. *Scapi* graciles, circa 5 cm. longi, vaginis lanceolatis paucis obtecti. *Bracteae* lanceolatae, acuminatae, 6–7 mm. longae. *Flores* umbellati, circa 6, mediocres. *Pedicelli* 6–7 mm. longi. *Sepalum* posticum ovato-oblongum, subobtusum, eciliatum, 3–4 mm. longum, trinerve, venis sparce papillosis ; sepala lateralia lanceolato-linearia, acuminata, plus minusve connata, 2–2·5 cm. longa, infra medium copiose papilloso-hispida. *Petala* lata elliptico-oblonga, obtusa, eciliata, 3–4 mm. longa, trinervia. *Labellum* recurvum, oblongum, obtusum, canaliculatum, glabrum, 2 mm. longum. *Columna* lata, 1·5 mm. longa, dentibus brevibus subacutis.

SIAM. Mountains round Chiengmai, on deciduous trees at 600 m. alt., *Dr. Arthur Kerr*.

Flowered at the Trinity College Botanic Garden, Dublin, in July, 1907, and sent to Kew for determination by Prof. Henry H. Dixon. The dorsal sepal and petals are lined with dark purple on a pale ground, and the lateral sepals marbled and speckled with red-brown. The remarkable papillose-hispid lateral sepals show a character not previously observed in the genus.

305. **Coelogyne virescens**, *Rolfe* ; a *C. Parishii*, Hook. f., labello angustius, disco tricarinato carinis crenulatis non crebre papillosis differt.

Pseudobulbi oblongi, crassi, subtetragoni, leviter sulcati, circa 11 cm. longi, 2·5 cm. lati, apice diphylli. *Folia* lanceolato-oblonga, acuminata, undulata, circa 18 cm. longa, 4 cm. lata. *Racemi* terminales, circa 15 cm. longi, 5-flori, basi vaginis lanceolatis

obtecti. *Bracteae* lanceolatae, acuminatae, concavae ; carinatae, 2–3 cm. longae, persistentes. *Pedicelli* 1·5–2 cm. longi. *Flores* mediocres, pallide viridi, labello atro-punctati. *Sepala* patentia, late lanceolata, acuminata, carinata, 3 cm. longa, 1 cm. lata. *Petala* lineari-lanceolata, acuminata, apice leviter recurva. *Labellum* 2 cm. longum, trilobum, leviter recurvum ; lobi laterales oblongi, obtusi, 1 cm. longi ; lobus intermedius ovatus, apiculatus, valde undulatus ; discus tricarinatus, carinis crenulatis, lateralibus elevatis, media nana et prope basin duplicata. *Columna* clavata, subalata, 1·5 cm. longa.

ANNAM. In the cataract district, *Micholitz*.

Introduced by Messrs. Sander & Sons, and flowered in their nursery at St. Albans in April, 1907. With a general resemblance to *C. Parishii*, Hook. f. (*Bot. Mag.* t. 5323), the flowers are wholly different in the details of the crest.

306. **Geodorum pacificum**, *Rolfe* ; a *G. semicristatum*, Lindl., segmentis angustioribus, labelli lamellis non cristatus differt.

Rhizoma validum. *Caules* approximati, breves, 2–3-phylli, basi vaginis lanceolatis subimbricatis obtecti. *Folia* lanceolata vel oblongo-lanceolata, acuminata plicata, submembranacea, basi attenuata, 15–30 cm. longa, 2·5–5·5 cm. lata. *Scapi* erecti, 30–45 cm. longi, vaginis lanceolatis obtecti, apice nutantes ; racemi 2–5 cm. longi, multiflori. *Bracteae* lineari-lanceolatae, acuminatae, membranaceae, 5–14 cm. longae. *Pedicelli* circa 1 cm. longi. *Sepala* oblonga, obtusa, 1 cm. longa, 3 mm. lata. *Petala* oblonga, obtusa, 1 cm. longa, sepalis paullo breviora. *Labellum* sessile, oblongum, integrum, concavum, apice emarginatum vel brevissime bilobum, 1 cm. longum, 4 mm. latum, infra medium paullo dilatatum : discus obscure 4-lamellatus, lamellis ecristatis. *Columna* lata, 5 mm. longa. *Geodorum sp.*, Burkill in Journ. Linn. Soc. **xxxv.** p. 56.

POLYNESIA. Tonga Islands, Vavua, *C. S. Crosby* ; Solomon Islands, *C. M. Woodford.*

A drawing sent by Mr. C. M. Woodford from the Solomon Islands, represents the sepals and petals rose-pink, and the lip closely veined with crimson on a white ground, with the veins somewhat confluent in front, and the disc bright yellow.

307. **Polystachya Smytheana**, *Rolfe ;* affinis *P. elasticae*, Lindl., sed triplo brevioribus, et labelli ungue et limbo duplo brevioribus facile distinguenda.

Herba epiphytica, circa 5 cm. alta. *Rhizoma* validum. *Pseudobulbi* approximati, ovati, 6-8 mm. longi. *Folia* non vidi. *Scapi* erecti, circa 4 cm. longi, puberuli, basi vaginis lanceolatis acutis striatis imbricatis obtecti, circa 4–6-flori. *Bracteae* patentes, latissime ovatae, apiculatae, denticulatae, 1·5–2 cm. longae. *Pedicelli* 6–8 mm. longi, sparse puberuli. *Flores* mediocres, pallidi, labello roseo-suffusi medio pulvino flavo ornato. Sepalum posticum elliptico-oblongum, obtusum, concavum, prope apicem in dente subulato productum ; sepala lateralia latissime triangulari-ovata, mucronata, 5 mm. longa, 8 mm. lata. *Petala* elliptico-oblonga.

obtusa, 5 mm. longa. *Labellum* breviter et late unguiculatum, trilobum, circa 1 cm. longum, infra medium reflexum; lobi laterales oblongi, subobtusi, 1·5 mm. longi; lobus intermedius late unguiculatus, orbiculari-reniformis, obtusus, paullo undulatus, circa 7 mm. latus; isthmus 5 mm. longus, 3 mm. latus, medio constrictus, margine undulatus; disci pulvinus oblongus, 3 mm. longus. *Columna* lata, 2 mm. longa.

SIERRA LEONE. *C. W. Smythe*, 56.

308. **Polystachya liberica**, *Rolfe*; a *P. Smytheana*, Rolfe, scapis robustioribus, floribus majoribus et labelli isthmo latiori differt.

Scapi erecti, 8–9 cm. longi, pubescentes, basi vaginis lanceolatis acutis striatis imbricatis obtecti, circa 10–14-flori. *Bracteae* patentes, latissime ovatae, apiculatae, denticulatae, concavae, 1·5–2 mm. longae. *Pedicelli* 6–10 mm. longi, pubescentes. *Flores* mediocres, pallidi, labello roseo-purpureo medio pulvino flavo ornato. *Sepalum* posticum elliptico-oblongum, apiculatum et prope apicem in dente subulato productum, 1 cm. longum; sepala lateralia latissime triangulari-ovata, mucronata, 6 mm. longa, 7 mm. lata. *Petala* oblonga, obtusa, 5 mm. longa. *Labellum* breviter et late unguiculatum, trilobum, circa 1 cm. longum, basi concavum, infra medium reflexum; lobi laterales oblongi, apiculati, fere 2 mm. longi; lobus intermedius late unguiculatus, transverse oblongus, obtusissimus, circa 7 mm. latus; isthmus 5 mm. longus, 4 mm. latus, margine undulatus; disci pulvinus elliptico-oblongus, 3–4 mm. longus. *Columna* lata, 2 mm. longa.

LIBERIA. *Sir H. H. Johnston.*

The two preceding species are allied to *P. elastica*, Lindl., a native of Sierra Leone, which for a long period was unique in the genus on account of the elongated reflexed limb of the lip. One other has since been described, namely *P. epiphytica*, De Wild., a native of the Congo district.

309. **Stauropsis Woodfordii**, *Rolfe*; habitu *S. Warocqueanae*, Rolfe, sed floribus duplo minoribus facile distinguenda.

Caules erecti, subelongati. *Folia* disticha, laxa, patentia, oblonga, obtusa, 9–11 cm. longa. *Scapi* erecti, circa 30 cm. alti, paniculati: panicula ampla, multiflora; rami 6–8 cm. longi. *Bracteae* patentes, obovato-oblongae, obtusae, concavae, circa 5 mm. longae. *Pedicelli* crassiusculi, circa 1 cm. longi. *Flores* carnosi, gilvi, brunneo-maculati. *Sepala* patentia elliptico-oblonga, obtusa, 8–10 mm. longa. *Petala* patentia, obovata, obtusa, sepalis paullo breviora. *Labellum* trilobum, circa 8 mm. longum; lobi laterales lati, brevissimi, obtusi; lobus intermedius lateraliter compressus, acutus, carinatus, prope basin callo erecto instructus; calcar brevissimum. *Columna* crassa, circa 2 mm. longa.

SOLOMON ISLANDS. New Georgia, *Officers of H.M.S. Penguin*; Ysabel Island, *C. M. Woodford.*

310. **Sarcochilus solomonensis**, *Rolfe*; a *S. Engleriano*, Kränzl., floribus majoribus, petalis sepalis angustioribus omnino liberis, calcari oblonga differt.

Caulis brevis, erectus. *Folia* disticha, recurva, oblonga, oblique bidentata. *Scapi* penduli, circa 30 cm. longi; racemi circa 15 cm. longi, multiflori. *Bracteae* patentes, triangulari-ovatae, acuminatae, 2–3 mm. longae, basi concavae. *Pedicelli* patentes vel reflexi, graciles, 1–5 cm. longi. *Flores* gilvi, brunneo-punctati. *Sepala* subpatentia, unguiculata, 1·2–1·5 cm. longa, limbus late ellipticus, obtusus. *Petala* subpatentia, unguiculata, sepalis paullo minora. *Labellum* unguiculatum, trilobum, circa 6 mm. longum; unque lineari angustissimo, lobis lateralibus patentibus falcato-oblongis obtusis, lobo intermedio minuto, disco tuberculo minuto instructo, calcari erecto oblongo obtuso. *Columna* oblonga, circa 2 mm. longa.

SOLOMON ISLANDS. Tulagi, *C. M. Woodford.*

Described from an inflorescence and from a photograph of the whole plant. It is said to be common throughout the Solomon Islands.

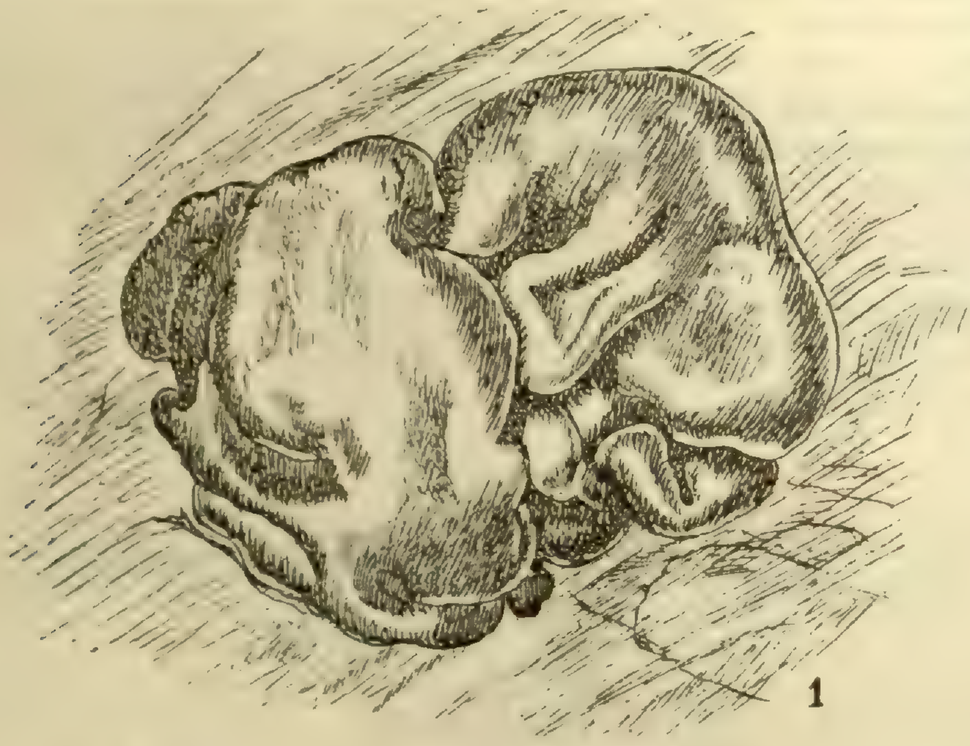
XII.—THE APPEARANCE OF COLPOMENIA SINUOSA IN BRITAIN.

A. D. COTTON.

Colpomenia sinuosa, Derbes & Sol., a Brown Alga of the family *Encoeliaceae*, is a plant that is found throughout the warmer seas, being known both from the tropics and from temperate regions. It occurs abundantly in the Mediterranean, but until recently has not been recorded in Europe farther north than Cadiz. In 1906 two French observers drew attention to the appearance of *Colpomenia sinuosa* on the S.W. coast of Brittany, and during 1907 further notes were published on its occurrence at various localities in the neighbourhood of Cherbourg. Its presence may now be chronicled on the coasts of Britain, specimens having been collected by Mr. E. M. Holmes at Torquay in September, 1907, and by the writer at Swanage in the previous April. The appearance in these regions of an alga not previously known nearer than the south of Spain is of considerable interest, especially when it is not a question of isolated individuals, but of the apparent establishment of the plant in several widely separated localities. *Colpomenia sinuosa* is moreover of importance from an economic standpoint, in that it may occasion considerable damage to the oyster industry.

Though frequent in the Mediterranean, and well known from other parts of the world, a complete account of *Colpomenia sinuosa* has never been published. For this reason it was not without some hesitation that the British plants were referred to that species, especially as they did not altogether agree with such descriptions as had previously appeared. Specimens were therefore submitted to M. Bornet who has been kind enough to examine them and to confirm the identification. The Torquay specimens agree in a general way with the account furnished

by Miss Mitchell (1), which is the fullest hitherto published; there are however several variations from the description given by that writer. These variations may possibly be explained by differences in age and in the season of collecting. It is hoped that, when the investigation of the structure and development is complete, it will be possible to publish a full account elsewhere.



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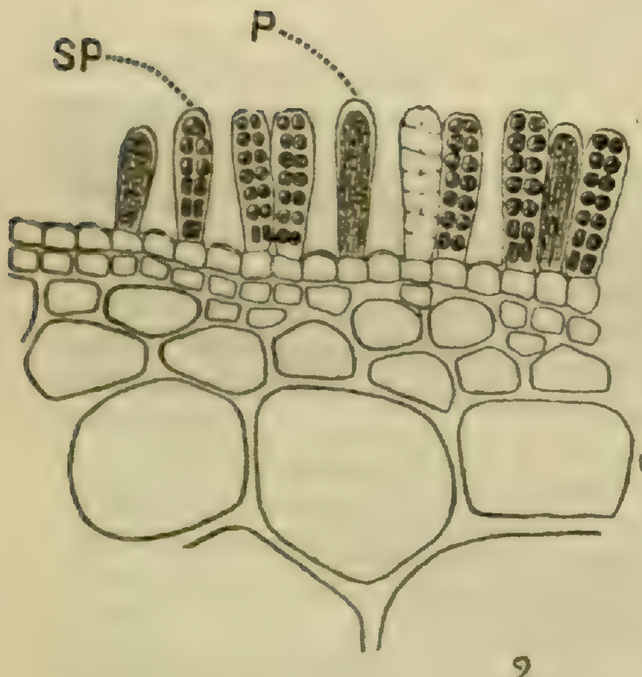

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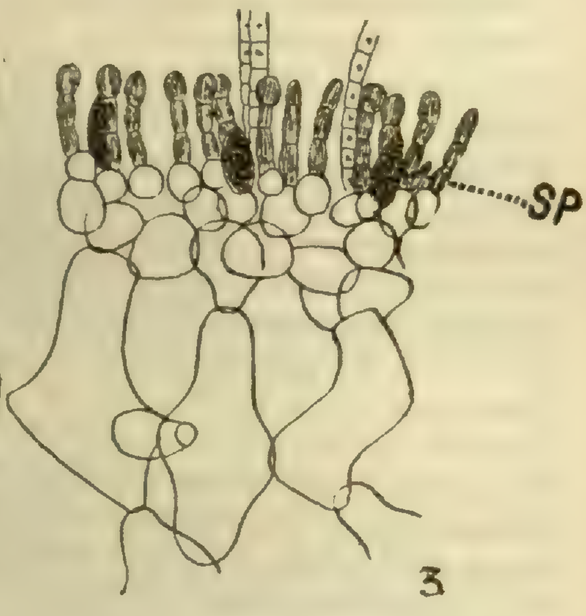

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Fig. 1. COLPOMENIA SINUOSA. Derbes & Sol. Natural size, (after Oltmanns).

Fig. 2. COLPOMENIA SINUOSA. Portion of section of fertile plant, showing pseudoparenchymatous structure. *Sp.* = plurilocular sporangia. *P.* = paraphyses. × 400.

Fig. 3. LEATHESIA DIFFORMIS, Aresch. Section through portion of a fertile plant showing the structure, which is not pseudoparenchymatous but more or less filamentous. *Sp.*=Unilocular sporangia. × about 200, (after Thuret).

In external form *Colpomenia sinuosa* resembles *Leathesia difformis*, a species with which it has often been confused. It may be distingushed from that plant by the thinner non-gelatinous

walls, and by the structure, which is cellular and not filamentous. *Leathesia* also is usually irregularly lobed even when quite young, and has a resiliency which is lacking in *Colpomenia*.

The history of the appearance of *Colpomenia sinuosa* on the West Coast of France and in the English Channel is as follows. In 1906, M. Fabre-Domergue, Inspector-General of Marine Fisheries, recorded (2) the appearance of a seaweed at Vannes, in the Gulf of Morbihan, which caused the oyster-cultivators considerable anxiety. The plant was determined by Bornet to be *Colpomenia*. Fabre-Domergue states that the cultivators gave the seaweed the name of "Ballons" from the fact of their becoming, after exposure to the atmosphere at the lowest tides, partially filled with air, and floating to the surface of the water at the return tide. Considerable damage was done to the oyster-beds by the "ballons" not infrequently bringing with them to the surface the young oysters amongst which they had been growing. The author quotes a communication from Bornet, stating that the alga was not positively known to occur north of Cadiz, and that records of its presence on the North Coast of Spain are unreliable, especially as *Leathesia*, which is found on that coast, is not cited in Lazaro's catalogue. Amongst methods employed by the oyster-cultivators to destroy *Colpomenia*, the only one which had been in any measure successful, was that of breaking the "ballons" by sweeping the oyster-beds with bundles of prickly branches ("fagots épineux"). Fabre-Domergue suggested that the special conditions of Vannes in the Gulf of Morbihan were favourable to the growth of this southern species, but that after the first severe winter it would probably disappear.

At the end of the same year Sauvageau (3) published a paper on the occurrence of *Colpomenia* on the oyster-beds of the river Vannes, and recorded it from Belle Isle and Quiberon, two new localities in the same neighbourhood. From its distribution and abundance, the author believed that it had been introduced several years previously and had already become acclimatised. The floating of the alga is explained by Sauvageau in the following manner. "Le *Colpomenia* très jeunes est massif ; il se creuse en augmentant de volume. Il a une base étroite qui est son point d'attache ; soit par désorganisation localisée, soit par suite de l'irrégularité du support, cette base présente des ouvertures par lesquelles l'eau s'écoule. Au retour du flot, l'eau pénètre dans l'Algue par dessous, emprisonne l'air et constitue le ballon, qui est capable de soulever un support non fixé. Normalement, le *Colpomenia* étant adhérant au rocher, ou à des Algues fixées, n'est pas transporté par le courant comme celui de la Rivière de Vannes." Sauvageau also remarks that the method of breaking the "ballons" though efficacious in preventing the tendency to float is neither curative nor preventive, in fact the reverse, since the sporangia-bearing fragments of the algae are borne away by the currents and dispersion promoted. The number of oysters carried away from the beds is considerable, at times so much so, that the cultivators take the trouble to recapture them with nets.

In the beginning of April, 1907, *Colpomenia* was collected by several botanists in the neighbourhood of Cherbourg. Corbière (4) published a note on the subject, and added in a postscript that

he had seen a dried specimen from the same locality collected in March of the previous year. Bornet confirmed Corbière's identification. Two further notes were published by Mangin (5 and 6), who recorded the plant from several additional stations (Gatteville, Tatihou, and Barfleur). His specimens were collected on March 31, and April 1, 1907. Mangin also states that M. Malard, Assistant Director of the Marine Laboratory of the Tatihou Museum, informed him that the alga was first observed in September, 1905. Fauvel (7) also noted the occurrence of the plant in the same neighbourhood.

In September, 1907, the writer received from Mr. E. M. Holmes some dried specimens of an alga like *Leathesia* collected at Torquay, with a request to examine its structure. Mr. Holmes stated that the plant was quite distinct from *Leathesia*, and suggested a *Colpomenia* affinity. The specimens were immature, and, except for a minute fragment, sterile. The plant occurred fairly plentifully at Torquay, being found as an epiphyte on *Corallina*, *Rhodymenia palmata*, etc., and later supplies afforded fertile material. The first of these was a fine specimen about the size of a tennis ball, the remainder, which have been sent at intervals during the autumn, have been smaller. The fertile material showed the general structure of *Colpomenia sinuosa*, though the sporangia differed somewhat in size and other details from those of published descriptions, and also from the slides in the British Museum prepared by Miss Mitchell and illustrative of her paper. Later consignments from Torquay being similar to the previous gatherings, specimens were sent to M. Bornet who agrees that the plant is the Mediterranean *C. sinuosa*, the alga which has invaded the coasts of Normandy and Brittany. The immature specimens sent by Mr. Holmes immediately recalled to the writer some small plants noted by him at Swanage on April 27th, 1907. The specimens, which fortunately had been preserved, prove on examination to be identical with Mr. Holmes's plant, and undoubtedly represent young plants of *C. sinuosa*. On gathering, they were doubtfully referred to young stages of *Leathesia*, with a note that the walls were very thin and non-gelatinous. At Swanage, as at Torquay, the plant occurred as an epiphyte.

From the above account, it will be seen that *Colpomenia sinuosa* appears to have thoroughly established itself in the waters of the English Channel. On the British shores, as on the coast of France, it has appeared at localities widely separated from each other, and that in considerable quantity. The localities from which it has been recorded are well-known hunting grounds for algae, and therefore frequently visited, and were other intervening places to be searched, it is possible that it would be found in them also. As to the manner and date of its arrival on the shores of Britain, definite evidence is not yet forthcoming. The writer spent a week at Swanage studying and collecting algae in April, 1906 without any trace of *Colpomenia* being observed. If the invader, as suggested by Sauvageau, were introduced to the coasts of Brittany some years ago and has since been spreading in an easterly direction, it is possible that it may have first established itself at Swanage during the winter of 1906–7. Currents may have played an important part in its advance. On the other hand,

it may have been directly introduced to our shores by vessels; or conceivably with the consignments of young oysters that are imported from France to be "fattened" on the British culture-grounds, from whence it may have travelled along the coast.

The naturalisation of a marine alga on foreign shores is interesting and uncommon. Cases are known in which algae have been introduced and may now be found settling down and slowly spreading in the immediate vicinity. The Japanese *Bonnemaisonia hamifera* is a case in point. This alga is confined to certain spots on the south coast of England, and is found in very small quantity only. With *Colpomenia* it is otherwise. For over a century it has been recognised from the Mediterranean region, but, as far as known, has not during that period spread in a northerly direction. By some means it has now appeared in various localities in France and England, where it thrives and spreads rapidly, the external conditions appearing to be perfectly suitable to vigorous growth. The presence of warm currents due to the Gulf Stream would probably account for a southern alga being able to flourish in the English Channel, though it is not easy to see why *Colpomenia* should not have spread previously along the coasts of Spain and Portugal, which receive the full benefit of the Gulf Stream. M. Bornet, in a letter to Mr. Holmes, suggests that *Colpomenia* has been brought to Vannes by the vessels that convey living lobsters from Portugal to be cultivated in the Gulf of Morbihan. This explanation is possible enough, although as noted above there is no certain record that the plant occurs on the Portuguese coast.

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XIII.—PATCHOULI.

(*Pogostemon Patchouli*, var. *suavis*, Hk. f. = *P. Cablin*, Benth.)

Patchouli has already been the subject of several articles in the *Kew Bulletin*. The earliest notice [K.B. 1888, p. 71] deals mainly with the source of commercial Patchouli; the second [K.B. 1888, p. 133] and third [K.B. 1889, p. 135] are chiefly concerned with the cultivation of the plant and the trade in Patchouli; the latest [K.B. 1902, p. 11] discusses the identity and range of distribution of another plant, *Microtoena cymosa*, Prain, which has the same odour as the Patchouli of commerce.

In the first of these notices of Patchouli is given the text of a letter [K.B. 1888, p. 73] addressed by Kew to the Government of India on 30th January, 1888, in which the information then available and the points still requiring elucidation are clearly and precisely put.

As that letter states the true Patchouli plant is free from ambiguity; it is the *Pogostemon Patchouli* described and figured by Sir William Hooker in the Kew Journal of Botany, vol. i., p. 328, t. 11, from cultivated specimens. This stands in the Flora of British India, vol. iv., p. 634, as *P. Patchouli*, var. *suavis*. The letter further records an opinion expressed by Professor D. Oliver that it is doubtful whether this particular form, which is the economic plant of commerce, be indigenous in any part of India. This opinion has, since 1888, been fully confirmed. The economic Patchouli plant, which is abundantly cultivated in the Straits Settlements, almost exclusively by Chinese immigrants, is an exotic so far as India is concerned. The plant occurs in the chief Botanic Gardens in India and Ceylon, but in private gardens, whether native or European, it is practically unknown. It was introduced to the Royal Botanic Garden at Calcutta in 1834, when Dr. Wallich received plants from Mr. G. Porter, then in charge of the Botanic Garden at Penang. At Calcutta the plant has never flowered, though descendants of the original plants, vegetatively propagated, still exist and thrive there. It has never flowered in the Botanic Garden at Saharanpur, where it was introduced from Calcutta. At the Royal Botanic Garden, Peradeniya, Dr. Trimen informed the writer it had not flowered during his directorship, and there was no record of its having flowered before his arrival in Ceylon. At Singapore, according to Mr. Hullett, no one had ever heard of its flowering; the evidence adduced by Mr. Wray [K.B. 1889, p. 136] points to its never having flowered at Penang or in Perak during the preceding 30 years. There are specimens at Kew which show that this plant is, or has been, in cultivation in Java and in Mauritius; in these islands also it appears never to flower. But there is no definite record of its cultivation on a commercial scale anywhere save in Penang and Perak.

There was no evidence in the Kew Herbarium in 1888, and there still is none, of the existence of any form of *Pogostemon Patchouli*, scented or scentless, in the Khasia or Assam region. The same was then and still is true of the Calcutta Herbarium. But the same is still true, as regards both Herbaria, of China, so

that the additional suggestion made in 1888 by Professor Oliver, that the Patchouli plant of commerce may have originated in China, still lacks confirmation. Such a suggestion, seeing that the Patchouli plant of commerce is cultivated by the Chinese in the Straits Settlements, was certainly an extremely natural one to make. It now seems unlikely, however, that it may ever be confirmed. Not only has no *Pogostemon* with the Patchouli odour been reported from China; we are now aware that, though Patchouli is well known in China, the Chinese Patchouli plant is neither the Patchouli plant of commerce nor the Indian Patchouli plant, but is the plant with the Patchouli odour alluded to in the Kew Bulletin for 1888 as occurring in Khasia and Assam.

This latter plant, *Microtoena cymosa*, Prain, has been already dealt with [K.B. 1902, p. 11], and it is only necessary to repeat here that it is a Chinese species which seems to have spread southward, as a cultivated plant, to Manipur and the Khasia Hills in Assam and to the Shan States of Burma and Siam. There is, indeed, an isolated record of its having reached Java, not improbably as an importation by Chinese settlers; its cultivation there has not, however, persisted, and there is no indication that it ever reached Sumatra, Borneo or the Malay Peninsula.

It was pointed out [K.B. 1888, p. 74] that if this plant has the true odour it may have a commercial use in India. We know now that it possesses the distinctive odour in as marked a degree as the Patchouli plant of commerce itself. We know besides that though it is not now used commercially in India there was a time when this was the source of the Patchapat sold in the Calcutta market, in contradistinction to the market of Bombay, where at one time the Patchapat offered for sale was derived from a cultivated state of *Pogostemon Heyneanus*. In both markets, however, the Patchapat—Patchouli leaf—formerly sold has now been almost if not quite replaced by the leaf of the Patchouli plant of commerce, imported from the Straits Settlements. The cultivation of *Microtoena cymosa* lingers still in native gardens in the Khasia Hills, where its product is locally used; and that of *Pogostemon Heyneanus* is similarly continued in native gardens throughout the Indian Peninsula from the Concan and Berar southward to Coimbatore.

This latter possibility was fully anticipated in the earliest notice of Patchouli in this Bulletin [K.B. 1888, p. 74]. The scented cultivated form in question differs from the feral states of the plant, mentioned in the same place as being of common occurrence in the Western Peninsula of India from Bombay southward, chiefly in having leaves that are of a slightly thicker consistence. These feral states, of which there are two, both extending to Ceylon, are not clearly indigenous in any part of India. One form, much more frequently met with than the other, was described by Bentham in 1830 as *Pogostemon Heyneanus*—he had used the name for the first time [Wall. Cat. Lith. 1532] two years previously. The other form was later distinguished by Bentham as *P. Heyneanus*, var. *β*.

The more plentiful of the two forms is not, however, confined to India and Ceylon. It is not uncommon in Java, Sumatra, and Borneo; in the Malay Peninsula it has been collected in

almost every province. So far it does not seem to have been recorded from any Malay locality to the east of Borneo, but what may be another form of the species occurs in the Southern Shan states of Burma, side by side with the Chinese *Microtoena cymosa*, and the commoner Indian and Malayan form has more recently been found in the Philippine island of Mindanao, though as yet nowhere else in that group. When the nature of its habitat has been noted, whether in India, Malaya, or the Philippines, the records are very uniform; it is stated to occur in exposed sunny waste places; in waste ground near villages; at or near cleared camping grounds; near sites of abandoned dwellings; or in native gardens. The form that occurs in native gardens in India and Ceylon is also met with in gardens in Java; the same form has also been collected in Tonkin. So far, however, it has not been reported from Sumatra, the Malay Peninsula, or Borneo.

Though the name Patchapat—Patchouli leaf—is probably applied indifferently in Indian bazars to any leaf that has the characteristic Patchouli odour, there is no doubt that in Indian gardens in which the plant is grown the vernacular names Patchouli and Patcha are applied exclusively to the *scented cultivated state* of *P. Heyneanus*, with leaves rather thicker than those of the wild plant. The name *P. Patchowli*, which was first applied to *P. Heyneanus* by Dalzell and Gibson [Flor. Bomb. Addend. p. 66] in 1861, and was subsequently adopted in the Flora of British India, vol. iv., p. 633, is on this account very appropriate. Unfortunately, however, the name *P. Patchouli* cannot be employed for the plant to which the vernacular term Patchouli is alone applied; first, because the Indian plant known to the natives as Patchouli or Patcha had already been named *P. Heyneanus* in 1828; again, because the name *P. Patchouly*, which was used by Pelletier for the first time in 1844, was not applied by him to the plant known in the Indian vernaculars as Patchouli, but was given to the Patchouli of commerce, which is not an Indian plant at all.

This Patchouli of commerce, as already explained, stands in the Flora of British India as *Pogostemon Patchouli*, var. *suavis*. Now, however, that fuller material is available, it is found that the two Pogostemons which possess the Patchouli odour, viz.:—*P. Heyneanus*, Benth., or *P. Patchowli*, Dalz. & Gibs., the cultivated plant known in Indian native gardens as Patchouli, and *P. Patchouli*, var. *suavis*, the Patchouli of commerce, are even more distinct than they were thought to be when the account of the genus *Pogostemon* was drawn up for the Flora of British India. They admit of being treated as specifically separable. In *P. Heyneanus* the leaves are much thinner and are sparingly puberulous, or almost smooth; the flowers, which are freely produced in all the countries in which the plant has been found, are in small whorls less than half an inch across, separated by distinct interspaces throughout the spikes in which they are arranged; the corolla is glabrous outside except for a few hairs on the margin of the lower lip. In the Patchouli plant of commerce the leaves are thicker and firmer, and are densely pubescent, especially beneath; the flowers, which are freely produced only in the Philippines but which have occasionally

been met with also in European cultivated specimens, are in larger whorls, three-quarters of an inch across, which are contiguous throughout the spikes in which they are arranged, or have only the lowest whorl separated by an interspace from the rest of the spike; the corolla is uniformly pubescent outside.

The Patchouli plant of commerce has been differently named by different authors. Tenore, who flowered it in Italy in 1847, described it [Giorn. Bot. Ital., vol. ii., p. 56] as *P. suavis*. Sir William Hooker, who had received a plant of *P. suavis*, Ten., which flowered at Kew in 1849, described it as *P. Patchouli*, under the impression that it was in reality identical with the plant described by Pelletier, with whom it had flowered in France in 1844, as *P. Patchouly* [Mem. Soc. Sc. Orleans, vol. v., p. 277, t. 7]. The identity of *P. suavis*, Ten., with *P. Patchouly*, Pellet., was not admitted in the Flora of British India, and in that work it has been suggested that the plant to which Pelletier's description applies is the cultivated plant to which the Indian vernacular name Patchouli belongs, rather than the plant which yields the Patchouli of commerce. Now, however, that better material of the Patchouli plant of commerce has reached Kew from the Philippines, where it is sometimes grown in gardens, and where, as Mr. Merrill has recently ascertained, it is oftener wild, and is undoubtedly indigenous, it is found that Sir William Hooker's conclusions are certainly right. His identification of *P. suavis*, Ten., with *P. Patchouly*, Pellet., and his treatment of this plant as a quite distinct species, must both be sustained.

We are, however, fortunately relieved of the necessity of using for the Patchouli of commerce the name *P. Patchouly*, applied to it by Pelletier. In the Philippines, where the plant is native, it bears the vernacular name Cablan. This name was taken up by Blanco, who described the plant for the first time under the name *Mentha Cablin*. The plant was duly transferred by Bentham to its proper genus as *Pogostemon Cablin*. Bentham has thus provided a name for the Patchouli of commerce which has the double advantage of being botanically admissible and at the same time free from ambiguity.

So far then as Patchouli is concerned one or two points appear still to be obscure. It is not clear where the plant known to the natives of India as Patchouli or Patcha is indigenous, though on the whole it is probably a native of the western portion of the Indian Peninsula, as suggested in the *Kew Bulletin* for 1888, p. 74. Nor is it clear when the wild Philippine species, which is the source of the Patchouli of commerce, first began to be cultivated, or how this plant should have found its way into the hands of the Chinese immigrants who cultivate it in the Straits Settlements.

Two adulterants are mentioned by Wray [K. B. 1889, p. 137] as being added to commercial Patchouli. One of these, Perpulut, elsewhere [K. B. 1888, p. 72] termed Bupulut, is correctly given as *Urena lobata*, Linn. The other, Ruku, is stated to be *Ocimum Basilicum*, Linn., var. *pilosum*, Benth. To some extent this plant does appear to be so employed. But the name Ruku, as a rule, is not applied to *O. Basilicum*, but to *Hyptis graveolens*, Poit. In

pointing out this minor error in an article so valuable as that of Wray, it has to be added that the mistake is one for which Wray is not responsible, but is the result of imperfect diagnosis of the samples of detached leaves and fruiting calyces of Ruku supplied for identification.

XIV.—MISCELLANEOUS NOTES.

Rumpenheim Lilac.—For very many years there grew in the gardens of Cambridge Cottage at Kew (the residence of the two last Dukes of Cambridge) a pair of lilacs of somewhat unusual character. They have each formed a clean single trunk and have never produced sucker growths from the roots as lilacs mostly do. The trunk of the larger one is 4 feet 2 inches high and 2 feet in girth, and the flaky bark has the spiral arrangement, frequently seen in lilacs, very markedly shown. These plants are merely *Syringa vulgaris*, but the tree-like character is not common in this country. It may possibly be due to their having been raised from seed, and not from cuttings as is usually the case.

Besides their unusual appearance, these lilacs have a certain historical interest. They had both been brought from Rumpenheim-on-the-Main near Frankfort, a favourite palace of the Hesse Family. This place is frequently mentioned in Sheppard's *Private Life of the Duke of Cambridge*, from which work we learn that it was bequeathed by the Landgrave Frederick of Hesse to his children jointly. He also expressed the wish that they and their children should assemble there every second year. This desire was faithfully fulfilled. As long ago as 1837 when the late Duke was but 17 years of age, he wrote "I am delighted to be once more at dear old Rumpenheim." He made his accustomed pilgrimage to Rumpenheim for the last time on August 25, 1903, less than a year before he died.

With the death of the Duke in 1904 Kew ceased to be a place of royal residence, a distinction it had possessed since 1730, when Frederick Prince of Wales and his consort Augusta came to live at Kew House. Cambridge Cottage has now been given over by His Majesty the King for public use. These two lilacs have always been objects of peculiar interest to the Royal Family, especially to the descendants of the Landgrave Frederick above mentioned. H.R H. The Princess of Wales, who is his great grand-daughter, expressed a desire that one of them should be transferred to the gardens at Windsor. This was accordingly done in 1905. The other and larger one, which was growing in an unfavourable position, was removed on December 23, 1907, to the lawn in front of Kew Palace, a building which has even longer associations with the Royal Family than Cambridge Cottage.

Presentations to Museums.—The Royal Servian Commissioner for the Balkan States Exhibition, held at Earl's Court during 1907, has presented to the Museum a collection of 41 sections of trunks of Servian timber trees, also stems of flax and hemp grown in Servia, and hempen rope. [*See* Cases 17 and 110, Museum No. I.]

Mr. C. W. Anderson, Government Land Department, British Guiana, has presented :—I. Ball of Native spun cotton wrapped in leaf (undeterminable), spun by Wai-Woi Indians. [*See* Case 13, Museum No. I.] II. Arrow points poisoned with Wourali (*Strychnos toxifera*), used by Wai-Woi Indians, sources of Essequibo River, British Guiana. [*See* Case 79, Museum No. I.]

Messrs. J. H. Vavasseur & Co., Ltd., 4, Lloyd's Avenue, E.C., have presented a series of samples of desiccated Cocoa-Nut. [*See* Museum No. II., Room V., Table Case.]

Lady Hindlip has presented the following specimens collected by her in British Columbia :—I. *Sphagnum acutifolium*, Cassiar district, used by Indian women for wrapping up their babies. II. Dried plant of *Veratrum viride* from Wrangell, Alaska. The root is used by the Indians for the preparation of snuff.

Mr. W. Crosley, 65, Addison Road, W., has presented specimens of the nest of a Weaver bird collected by him in the Republic of Colombia. The nests are made of the leaves of a grass or sedge which are indeterminable. They were accompanied by a drawing by the donor, made from sketches taken on the spot, shewing the situation of the nests on the somewhat bare and extended branches of the taller trees. When sending the nests Mr. Crosley wrote as follows :—

"I am afraid I can't give give you mnch information as to the bird's habits. Its choice of a nesting place seems to be governed by the consideration of isolation and freedom from possibility of entanglement. A rather bare extended branch of a living tree, away from creepers and parasites, so that the swinging in a high wind would be harmless.

"I have no knowledge of any preference that they may show for any particular species of tree, but I do seem to recollect that they avoid the 'Ceiba' (which is the equivalent of the cottonwood tree of West Africa) as I never saw nests attached to that tree, although it is the giant tree of those forests, often running up to considerably over 100 feet before branching. The 'Ceiba' is considered more or less poisonous by the natives, whether from the dropping of the flowers and cotton, or from the effect of the roots, I don't know. Anyhow, water springing from near such trees or lying around them is considered 'Agua malsana.'"

For the specimens *see* Table Case, Room VII., Museum No. II.

J. M. H.

Additions to the Herbarium during 1907.—Over 12,000 sheets were presented or sent in exchange by about 120 persons and institutions, while over 7,000 sheets were purchased. The principal collections are enumerated below. Except where otherwise stated or implied, the collections purchased are named, and those presented are unnamed or only partially named.

VARIOUS PARTS OF THE WORLD. *Presented* :—Botanical collections of the late Dr. M. T. Masters, F.R.S., presented by Mrs. Masters ; duplicates, mainly Tropical American, by the Royal

Botanic Garden, Berlin ; collection of Ferns of the late John Day, by Mrs. Coke ; Gossypium, by Sir G. Watt ; Dioscorea, by the Department of Public Gardens and Plantations, Jamaica.

Purchased :—Kneucker, "Cyperaceae et Juncaceae Exsiccatae," lief. vi. ; "Gramineae Exsiccatae," lief. xxi.–xxii. ; C. F. Baker, "Economic Plants of the World," fasc. i.

EUROPE. *Presented* :—"Kryptogamae Exsiccatae," Cent. xiv., by the Imperial Natural History Museum, Vienna ; "Hieraciotheca Gallica et Hispanica," fasc. xvii.–xviii., by Messrs. Arvet-Touvet and Gautier ; "Plantae Finlandiae Exsiccatae," fasc. i.–viii., by the Botanical Museum, University of Helsingfors ; "Lichenes florae Rossiae Exsiccatae," fasc. i.–ii., by the Imperial Botanic Garden, St. Petersburg ; "Rosliny polskie," Cent. i.–ii., by Dr. M. Raciborski ; "Musci Galliae," concluding fascicle, by Mr. T. Husnot ; slides of British Florideae, by Mr. A. D. Cotton ; Juglans and Populus, by Mr. L. A. Dode.

Purchased :—Sydow, "Mycotheca Germanica," fasc. x.–xiii. ; Adamovic, Balkan Peninsula ; Dahlstedt, "Herbarium Hieraciorum Scandinaviae," Cent. xx.

NORTH AFRICA AND ORIENT. *Presented* :—"Plantae selectae ex Africa boreali," fasc. i., by Dr. Sv. Murbeck ; Western Persia, by Mr. Th. Strauss.

Purchased :—Bornmüller, Persia and Asia Minor.

EASTERN ASIA. *Presented* :—Named specimens, by the Natural History Museum, Paris ; by the Imperial Botanic Garden, St. Petersburg ; Chinese and Malayan Ferns, by Fleet-Surgeon C. G. Matthew.

INDIA AND MALAYA. *Presented* :—Scarce Bombay plants, by Dr. T. Cooke, C.I.E. ; Pulney Hills, Madras, by Dr. A. G. B. Bourne ; Burma, by Mr. J. H. Lace ; India and Tibet, by Mr. I. H. Burkill ; Podostemaceae, by the Royal Botanic Gardens, Peradeniya ; Malay Peninsula, by the Botanic Gardens, Singapore ; named Philippine Orchidaceae and Dipterocarpaceae, by the Bureau of Science, Manila ; Philippine Islands, by Mr. A. Loher.

Purchased :—Philippine Islands, Elmer.

AUSTRALASIA. *Presented* :—Scarce N. S. Wales plants, by the Botanic Gardens, Sydney ; S. Australia, by Mr. J. M. Black ; named Australian Marine Algae, by Mr. A. D. Cotton ; Franc, New Caledonia, named, by Mr. G. Bonati ; Solomon Islands, by Mr. C. M. Woodford, Resident and Deputy Commissioner ; New Zealand, by Mr. C. J. Burgess ; New Zealand Algae, by Mr. R. M. Laing.

Purchased :—Schlechter, New Caledonia.

TROPICAL AFRICA. *Presented* :—By Dr. Auguste Chevalier ; Sierra Leone, named, by Mr. C. W. Smythe ; Gold Coast, by Mr. A. E. Evans ; N. Nigeria, by Col. E. J. Lugard, D.S.O. ; W. R. Elliott, N. Nigeria, by the Imperial Institute ; S. Nigeria, by Mr. R. E. Dennett, by Mr. E. W. Foster, by Mr. A. H. Unwin ; Lagos, by Mr. E. W. Foster ; Sudan, by Mr. A. F. Broun ; Dawe and Brown, Uganda, by Mr. M. T. Dawe ; Somaliland Grasses, by Dr. R. E. Drake-Brockman ; Hutchins and Battiscombe, British

East Africa, by Mr. E. Hutchins ; British East Africa and Pemba, by Miss Barraud ; British East Africa, by Mr. H. Powell ; British Central Africa, by Mr. J. M. Purves ; Rhodesia, by Mr. C. E. F. Allen ; Southern Rhodesia, named, by Miss L. S. Gibbs ; W. H. Johnson, Mozambique, by the Companhia de Moçambique.

Purchased :—Zenker, Cameroons.

Mascarene Islands. *Presented* :—Aldabra, by Mr. H. P. Thomasset ; Seychelles, by Mr. R. Dupont ; Mauritius, by Mr. P. Koenig.

Purchased :—Boncard, Madagascar Fungi.

South Africa. *Presented* :—Schlechter, named, by Dr. H. Schinz ; Transvaal, &c., by the Transvaal Department of Agriculture ; named Transvaal Asclepiadaceae, by Mr. P. Conrath ; Natal, by the Botanic Gardens, Natal.

Purchased :—Pegler, Transkei.

North America. *Presented* :—By Judge J. R. Churchill ; Lindheimer's Texan plants of 1849–51, fasc. v., by the Missouri Botanic Garden ; Hebbasch, Labrador, by Sir W. MacGregor, G.C.M.G., C.B.

Purchased :—C. F. Baker, Pacific slope ; W. W. Eggleston, N.E. United States.

Mexico. *Presented* :—By the United States National Museum.

Purchased :—Palmer, Mexico ; Pringle, Mexico.

West Indies. Jamaica and Bermudas, named, by the New York Botanical Garden.

Tropical South America. *Presented* :—São Paulo, Brazil, by Dr. A. Usteri.

Purchased :—Lehmann, Colombia, &c., unnamed ; Fiebrig, Bolivia ; Hassler, Paraguay, unnamed.

Perhaps the most noteworthy accession was a fine set of partly named French Sudan and Congo plants, comprising over 1,500 sheets, presented by the collector, Dr. Auguste Chevalier. The collection has not yet been examined in detail, but many of the specimens come from regions that were previously botanically unknown or little explored.

Specimens of numerous interesting economic plants were received, amongst which the following may be mentioned :—*Cordeauxia edulis*, Hemsl., a low bush which yields the "yeheb nut" of Somaliland (see *Kew Bull.*, 1907, p. 361) ; *Mascarenhasia elastica*, K. Schum., the Mgoa rubber-tree of East Africa (*l.c.*, p. 283) ; and *Parthenium argentatum*, A. Gray, which yields the Guayule rubber of Mexico (*l.c.*, p. 285).

Telosma, *Coville* (*Prageluria*, N. E. Br.).—The name *Prageluria* was proposed in the *Kew Bulletin*, 1907, p. 325, for the genus which has hitherto been mistaken for *Pergularia*, Linn. It transpires, however, that Coville had in 1905 proposed the name *Telosma* for the same genus (*Contributions from the United States National Herbarium*, ix., p. 384). This name, which appears in an alphabetical descriptive list "The Useful Plants of the Island of Guam," had been entirely overlooked. *Telosma* therefore replaces *Pergularia* in Benth. and Hook. fil. *Genera Plantarum*, ii., p. 773.

N. E. B.

Research in Jodrell Laboratory in 1907:—

Boodle, L. A.—N'hangellite and Coorongite. (Kew Bull., 1907, pp. 145–151.)

Boodle, L. A.—Microscopic Structure of the Ovule of *Juliania adstringens*. (In Hemsley, W. B.—On the Julianaceae: A New Natural Order of Plants; Phil. Trans. Roy. Soc., B., Vol. 199, pp. 185–188, with eight Figs. in text.)

Brandis, D.—Remarks on the Structure of Bamboo Leaves (Trans. Linn. Soc., 2 Ser. Bot., Vol. VII., pp. 69–92, tt. 11–14.)

Hickling, G.—The Anatomy of *Palaeostachya vera*. (Ann. Bot., Vol. XXI., pp. 369–386, tt. 32–33, with four Figs. in text.)

Lawson, A. A.—The Gametophytes, Fertilization and Embryo of *Cephalotaxus drupacea*. (Ann. Bot., Vol. XXI., pp. 1–23, tt. 1–4.)

Lawson, A. A.—The Gametophytes and Embryo of the Cupressineae with special reference to *Libocedrus decurrens*. (Ann. Bot., Vol. XXI., pp. 281–301, tt. 24–26.)

Massee, G.—Plant Diseases: VII.—"Cluster-cup" Disease of Conifers. (Kew Bull., 1907, pp. 1–3, with one plate.)

Massee, G.—Plant Diseases: VIII.—Degeneration in Potatoes. (Kew Bull., 1907, pp. 307–311, with one plate.)

[Massee, G.]—A Pine Disease (*Diplodia pinea*). (Journ. Board Agric., Vol. XIV., pp. 164–166.)

[Massee, G.]—Clover Sickness. (Journ. Board Agric., Vol. XIV., pp. 223–227, with two Figs. in text.)

[Massee, G.]—Degeneration in Potatoes. (Journ. Board Agric., Vol. XIV., pp. 385–389, with one plate.)

Salmon, E. S.—On a Fungus Disease of the Cherry-Laurel (*Prunus Laurocerasus*, Linn.). (Reprint, 1907, from Journ. Roy. Hort. Soc., Vol. XXXI., 1906, pp. 142–146, with one Fig. in text.)

Scott, D. H. and Maslen, A. J.—The Structure of the Palaeozoic Seeds, *Trigonocarpus Parkinsoni*, Brongniart, and *Trigonocarpus Oliveri*, sp. nov. Part I. (Ann. Bot., Vol. XXI., pp. 89–134, tt. 11–14.)

Worsdell, W. C.—The Origin of the "Flower." Science Progress in the Twentieth Century, Vol. II., pp. 255-262.

Dr. J. Berghs, of the Institut Carnoy, Louvain, studied the cytology of certain fresh-water algae, and especially the cell-division of the Conjugatae.

Mr. L. A. Boodle completed an investigation on the germination of the spores of filmy species of *Todea* under different conditions, the chief point being the comparison of prothalli, produced by germination in closed sporangia, with prothalli grown from free spores. Mr. Boodle continued a study of some anatomical points in the ovule of *Cycas*, and made cultural experiments with a species of *Bromus* and other plants, and investigated the nature of a substance called "N'hangellite." This is a curious product resembling bitumen and apparently derived chiefly from a gelatinous Alga : see above.

Dr. F. E. Fritsch and Miss M. E. Narborough began a series of experiments on the osmotic pressure of the cell-sap in Algae, and other factors affecting growth, &c.

Mr. P. Groom began a research on the occurrence of fat in different Phanerogamous plants.

Mr. W. E. Hiley examined the vascular structure of *Gleichenia pectinata*, and compared it with that of other species, the chief interest of the comparison being due to the fact that *G. pectinata* has solenostelic structure, while all the other species of the genus, as far as is known, are protostelic.

Dr. A. A. Lawson continued his series of investigations on the morphology of the Gymnosperms, and made a special study of the gametophytes and embryo of the Cupressineae. His conclusion, derived principally from a consideration of the presence or absence of certain vestigial structures, is that the Cupressineae do not present as many primitive characters as the Abietineae, but are more primitive than *Cephalotaxus* : see above.

Mr. A. J. Maslen studied the course of the vascular bundles in the ovules of several Cycads.

Mr. W. C. Worsdell continued to collect materials for a general morphological work on Vegetable Teratology ; and also carried on his investigations on the anatomy of Dicotyledons, as a means of elucidating their relationship to Monocotyledons, and determining the nature of the primitive type of structure from which the present vascular structure of both groups of plants has been derived. Mr. Worsdell also made a special morphological and anatomical study of *Paeonia*, with a view to determining the true systematic position of this genus.

Pathology.—During the past year over six hundred reports on plant diseases have been issued. A great number of specimens infected, or suspected of being infected, by American gooseberry

mildew have been submitted for examination. A point of importance in connection with this disease is the fact that the winter fruit or perithecia fall from the shoots during October, in considerable numbers, hence, to secure the greatest benefit from pruning, the work should not be delayed beyond the time indicated, as the spores from the perithecia which fall to the ground may infect young shoots in the following spring.

A series of experiments on certain species of Dodder failed to prove that dredging with calcium sulphide was a destructive measure.

The work bearing on the transmission of disease by means of hibernating mycelium in potatoes has been continued during the past year. On the assumption that the mycelium is often, if not always, present in tubers showing no obvious signs of disease, numerous specimens of apparently sound tubers were specially treated, and a considerable percentage of these have been proved to contain mycelium.

Black scab of potatoes has also been under investigation.

Diseased material has been received for examination at Kew from various British colonies and dependencies.

Botanical Magazine for January.—The plants figured and described are: × *Philodendron Corsinianum*, Makoy, *Paeonia Mlokosewitschii*, Lomakin, *Viburnum utile*, Hemsl., *Herbertia amatorum*, C. H. Wright, and *Pseudolarix Fortunei*, Mayr. The *Philodendron* is remarkable in being the only known artificial hybrid in the genus. Its spathe is about eight inches long, and is brilliantly coloured. The following note on its history, by Dr. A. Ragionieri, Castello, near Florence, Italy, appeared in *Gardeners' Chronicle* for February 1, 1908 :—" × *Philodendron Corsinianum* belongs to a very interesting series of hybrids raised more than 20 years ago in the public gardens of 'Le Cascine,' in Florence, by the foreman, Mr. Ferdinando Ragionieri (now head gardener to H.E. the Prince of Venosa, at Albano, near Rome), and the Director, Cav. A. Pucci. . . . × *Philodendron Corsinianum* is a cross between P. Lindenii ♀ and P. lucidum ♂. It was dedicated to H.E. the Prince Corsini, then Mayor of Florence. The entire stock of the plant was purchased by Messrs. Makoy, of Liege." *Paeonia Mlokosewitschii* is a Caucasian species, and is described as the most handsome of those producing yellow flowers. The plant has recently been introduced into the garden of Mr. W. E. Gumbleton, of Belgrove, Queenstown, where it flowered in May last, and material furnished by it was used in the preparation of the figure. There are now young plants at Kew which were raised from seed received from the Tiflis Botanic Garden. The Chinese *Viburnum utile* has been figured from a specimen grown in the nursery of Messrs. James Veitch & Sons at Coombe Wood. It is a pretty species, distinguished from its allies by its thick leaves which are glabrous above and densely tomentose beneath. The

flowers are white when fully expanded, and are all similar and hermaphrodite. It is expected to prove a valuable addition to the number of hardy flowering shrubs of which so many have been introduced by Messrs. Veitch during the last few years. *Herbertia amatorum* was described for the first time last year (*Kew Bulletin*, 1907, p. 321), from material raised from seed sent to Kew by Dr. C. B. Cantera, of Montevideo, Uruguay. It differs from *H. amoena*, Griseb., and *H. coerulea*, Herb., in having a white obcordate blotch on the claws of the outer perianth-segments. It is the most handsome of the species so far introduced. *Pseudolarix Fortunei* has been in cultivation for many years, seeds having first been sent to England by Fortune in 1853, but it is not common in gardens, and appears to be rare in its native country, China. Fortune found it only in the Province of Chekiang; since his time it has been met with in Kiangsi. The drawing was prepared from a tree which flowered at Kew in June, 1907.

The Red Rust of Tea.—By H. H. Mann and C. M. Hutchinson. (*Memoirs of the Department of Agriculture of India*, Vol. I., No. 6, 1907.)

The disease of the tea plant, known as Red Rust, *Cephaleuros virescens*, Kunze, is of special interest to botanists in that it is one of the few cases in which an alga is parasitic upon a flowering plant.

First observed about 1880, and determined by Cunningham in 1889 to be caused by an algal parasite, Red Rust has during recent years assumed serious proportions. In the latest contribution to the subject several new points are brought to light, a short account therefore of the disease may not be without interest.

Cephaleuros virescens, Kunze, the alga in question, is a member of the *Trentepohliaceae*. That order, although one of the *Chlorophyceae*, is characterised by the possession of haematochromin, a pigment which usually masks the chlorophyll giving the algae an orange or brownish-red hue. Members of the *Trentepohliaceae* are abundant in the tropics, many species occurring as epiphytes on hard-leaved plants, where they frequently enter into combination with fungi to form lichens. In our own country the well-known *Trentepohlia aurea* is a representative of the group.

After an introductory and historical chapter the authors turn to the general effect of *Cephaleuros virescens*, and point out the two distinct forms in which Red Rust is found, viz., the leaf form and the stem form.

On the leaf the alga is usually epiphytic, and the damage occasioned is insignificant; on the stems and branches, on the other hand, it is endophytic, and the effect is more serious. The shoots gradually become unhealthy and die, and, in bad cases, entire trees ultimately succumb.

The details concerning the leaf-form need not be referred to here, the blight in that position being only important as a source

of infection to the stems. The principal features of its development are well known through the work of Cunningham, Ward, and Karsten.

With the form on the young shoots the case is different, and to this the authors pay special attention. The tea plants which are pruned between December and March show no marked sign of disease till the end of March or April, but after the first heavy rains of the season red patches suddenly appear on the young wood. At the same time, or even earlier, the leaves will be seen to lack vigour and to be suffering from chlorosis. The red patches on the stem are due to numerous reproductive bodies of the alga which burst through the bark, and probably represent, as the authors suggest, the last stage of the parasite, infection having taken place the previous rainy season.

Dealing with the spread of the disease, it is pointed out that there are two methods by which the reproductive bodies may be dispersed: (1) wind may convey the sporangia as a whole; and (2) water, in the form of rain or dew, may afford a medium for the distribution of the motile zoospores. The second alternative excites no surprise, water being the natural vehicle for the spread of algal spores. Wind dispersion, on the other hand, may need further explanation. *Cephaleuros* possesses two types of reproductive bodies, gametangia, usually more or less sunk in the thallus, and zoosporangia, which are elevated on sterile hairs. Karsten showed that the zoosporangia ("haken-sporangia") possess a curious mechanism which provides for their detachment. A double ring of cellulose is formed at the junction of the stalk-cell and the sporangium, splitting takes place at this ring which causes the sporangium to be thrown off *in toto*. Dispersion by wind follows and the sporangium, after being moistened by rain or dew, matures and liberates zoospores in the usual manner. That wind distribution takes place by this method in Red Rust is highly probable, but the account given of the germination of the zoospores (pp. 14 and 15) will require confirmation before it will be accepted by botanists in general.

Experiments were conducted with reference to the passing of the disease (1) from leaf to leaf, and (2) from leaf to stem. The first series (leaf to leaf) was entirely successful in producing infection. The second series though regarded as convincing was not so decisive as could have been wished; the growth of the alga on the artificially infected shoots being poor and not altogether characteristic. Attempts to infect either leaves or shoots from infected stems were without result.

With regard to infection it is remarked that during the first year's growth the young shoots possess a rough irregular surface, but this during the second year is lost. Early stages of the disease are found in the crevices of the young bark and the authors are of opinion that the rough surface of the first year's growth is intimately connected with the infection of the shoots. The red patches which appear after the rains in April or May represent the fruiting stage of the infection of the rough surface of the previous year. Strong healthy shoots resist the disease by the formation of vigorous layers of bark, the alga being thus

thrown off. On weak poorly-developed shoots, on the contrary, the alga readily succeeds in getting a foothold and forcing its way through the bark reaches the cortical tissues. In bad cases the parasite may completely encircle the shoots and that for a length of several inches.

The practical conclusions to be drawn from the investigations are as follows. Cutting out infected shoots in May, and spraying at the same time of year proved useless, as also firing the bushes and collar-pruning. The most hopeful line of treatment is to promote healthy vigorous growth through good cultivation by attention to soil and drainage, at the same time removing weak and twiggy shoots. Overplucking should be strenuously guarded against, nothing causing lack of luxuriance more frequently than this. The destruction of infected leaves beyond those removed in pruning is not advocated, the alga being found too abundantly both on tea and other trees to be in this way materially reduced.

In the disease dealt with above *Cephaleuros* is a parasite on the tea plant ; algae that are endophytic on the higher plants are not uncommon, but those that appear to be positively parasitic are extremely rare. The following cases may be referred to. Three other species of *Cephaleuros* are known to be injurious to foliage. *C. parasiticus* on *Calathea metallica*, *C. minimus* on *Zizyphus jubata*, and *C. Coffeae* on *Coffea liberica*. Amongst the *Protococcoideae*, *Chlorochytrium* and *Phyllobium* have been regarded as parasites, but the researches of Klebs have shown that the injury occasioned to the host-plant is practically nil. A closely related genus, *Rhodochytrium* presents, however, a decided advance in the direction of parasitism. *R. Spilanthidis*, found in the leaves of the Composite *Spilanthes* in Chili and Ecuador, is remarkable in not possessing chlorophyll. The spores of the alga germinate on the leaves of the host, the germ tube forces its way between the epidermal calls, enters the internal tissues, and sends out branches in the neighbourhood of the vascular bundles. Later a spherical body is developed, through the enlargement of the original germ-tube, in which the spores are formed. Another case is that of *Phytophysa Treubii* which has been described as forming gall-like swellings on the leaves and shoots of *Pilea* in Java. Here again the alga appears to be parasitic, and the tissue involved in the formation of the gall is not only that of the cortex but also that of the vascular system. Finally there may be mentioned the remarkable *Phyllosiphon Arisari*. This alga, parasitic in the leaves of *Arisarum vulgare*, is a member of the *Siphoneae* producing a richly branched system of tubes, without the formation of cross-walls. Sections through the infected areas of the leaf show dichotomously branched filaments which grow vigorously in the intercellular spaces, and form fruiting-bodies. The alga is regarded as a parasite, in that the filaments, although not piercing the cell-walls of the host, cause the death of those cells with which they come in contact, and in this way produce the large yellow blotches characteristic of the disease.

A. D. C.

New Zealand Fungi.—The second part of Massee's Fungus Flora of New Zealand was published in the Transactions of the New Zealand Institute, vol. xxxix. 1906 (issued June, 1907), bringing to a conclusion the consideration of the *Hymenomycetes*. The groups dealt with are the *Polyporeae*, *Hydneae*, *Thelephoreae*, *Clavarieae*, and *Tremellineae*.

The *Polyporus* group is well represented, species of *Polyporus* and *Polystictus* being as usual most abundant. *Boletus*, on the other hand, is at present unknown from New Zealand, a somewhat surprising fact, though probably to be explained by the difficulty that exists in drying specimens. Amongst tree parasites are to be found *Fomes igniarius*, and *F. salicinus*. A remarkable note is added in connection with edible *Hirneola polytrichi*. On the authority of Mr. T. Kirk this fungus "is collected and sent to China, where it is highly prized for food and medicine. In 1877, 220 tons, valued at £11,318, were collected in New Zealand and exported."

A. D. C.

The Flora of New Zealand.—The Educational Department of the Government of New Zealand has made arrangements for the publication of a series of 250 quarto, uncoloured illustrations of the native plants of that country. Mr. T. F. Cheeseman, Curator of the Museum at Auckland and author of the excellent Manual of the New Zealand Flora, which appeared in 1906, has been appointed Editor. The plates will be prepared in this country under the supervision of Mr. W. Botting Hemsley, Miss M. Smith is undertaking the drawings and Mr. J. N. Fitch their reproduction on stone.

Natal Botanic Gardens.—We are informed that the Natal Government have found themselves obliged to reduce the expenditure upon the Natal Botanic Gardens and the Herbarium. The grant to the Herbarium has been taken away entirely, whilst the grant to the Gardens has been reduced from £350 to £150. This action has necessitated the discharge of two of the assistants and a considerable reduction in the salaries of the Director and his Curators. It is difficult to see how the important work of the department can be carried on effectively under these straitened circumstances.

Solomon Islands Indigo (*Desmodium brachypodum*, A. Gray).—A collection of dried plants made in Ysabel Island, presented to Kew in 1893 by Archdeacon Comins, included a "dye-plant used by natives for staining their tappa cloth." It was identified with *Desmodium brachypodum*, A. Gray, a species, previously only known to inhabit Australia, where it has a wide range in the coastal region of New South Wales and Queensland. Further specimens were received in a collection made by the Officers of

H.M.S 'Penguin' in 1894–5; but these are not localized. Recently Mr. C. M. Woodford, Government Resident, British Solomon Islands, sent specimens accompanied by the following note:—"I now send some dried specimens and some seeds of a shrub from Ysabel Island for identication. It is the source of the native indigo dye, and so far as I know is peculiar to Ysabel. It is used for colouring the native bark cloth. The leaves are sprinkled with salt water and slightly wilted in the sun. They are then chewed by the women and the result is a dull blue stain in the mouth which has a very unpleasant appearance. To stain the cloth the women spit or smear the saliva upon it, altogether a very primitive and objectionable process."

So far as we are aware this plant has not been found elsewhere, except in Australia, though it may be expected to occur in New Guinea. It is not put to any use in Australia.

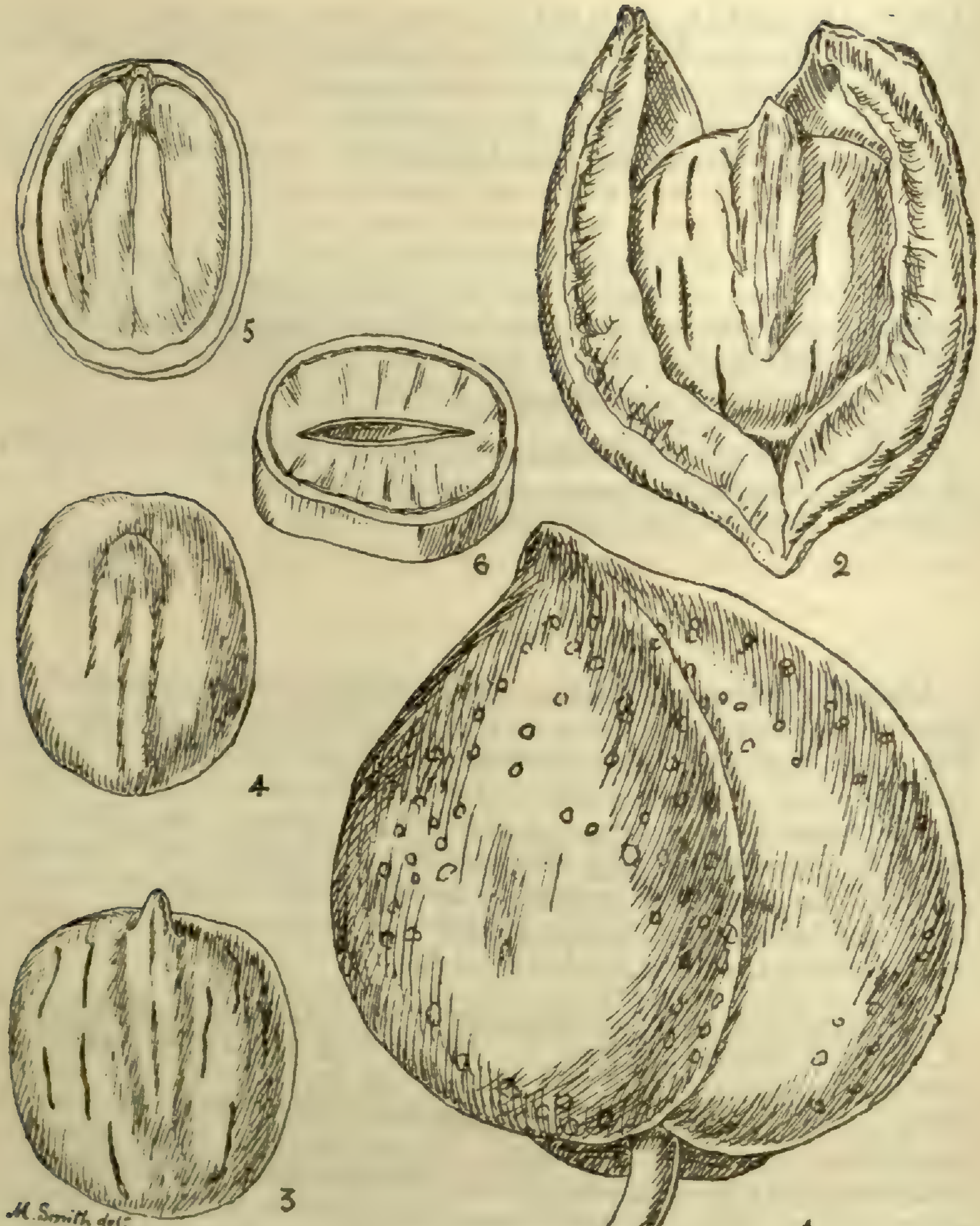
W. B. H.

Aleurites trisperma, *Blanco*.—A revision of the synonymy of the species of *Aleurites* is given in the *Kew Bulletin* for 1906, pp. 119–121. At that time Kew possessed only an imperfect flowering specimen of *A. trisperma*, and some seeds, without the testa, which were supposed to belong to this species. Mr. Elmer D. Merrill, Botanist of the Bureau of Agriculture and Forestry, Manila, has recently presented specimens of foliage and fruit, collected by himself, which enable us to give the distinguishing characters of the fruit of this species.

A. trisperma, Blanco, differs from both *A. cordata*, Steud., and *A. Fordii*, Hemsl. (*Hook. Ic. Pl.*, t. 2801 and 2802), in all the leaves being entire, and the flowers are smaller, the fruit larger with a thicker pericarp, and the very thin, distinctly nerved cotyledons are more decidedly cordate at the base. Mueller describes (*DC. Prodr.*, vol. xv., 2, p. 724) the leaves of *A. trisperma* as having a blade 10 to 12 cm. long with a somewhat longer petiole, but the largest leaves of the Kew specimens measure 25 by 20 cm. with a petiole 18 cm. long.

The synonymy of this species requires some explanation. Blanco (*Flora de Filipinas*, ed. 1, 1837, p. 755) described it under the name here adopted. In the second edition of the same work (1845) the description is repeated, p. 519, under the name *A. saponaria*, without any reference to the first name, and it is the same in the third, folio, edition, 1879, vol. iii. p. 19. The flowers are not figured in the plate 296 of the same work; but in the "Novissima Appendix" 1880, p. 191, *A. saponaria* is reduced to *A. trisperma*. The native names cited by Blanco are: Balocanad, Baguilumban, Calumban, and Balucanag. Mr. Merrill informs us that he has not met with this tree in an undoubtedly wild state in the Philippines. The oil, which is regarded as poisonous, is perhaps superior to Chinese Wood-oil (*K.B.*, 1906, p. 117) in its drying properties.

W. B. H.



Aleurites trisperma, Blanco.

Fig. 1, entire fruit, copied from Blanco (*Fl. Filip.* ed. 3, t. 296); 2, a carpel with seed in position; 3, a seed; 4, the same from which the testa has been removed; 5, longitudinal section of a seed showing the axile embryo; 6, a cross section of the same, from material supplied by Mr. Merrill. *All natural size.*

Spangle-galls eaten by birds.—In October of last year a small packet of "seeds" was received from Mr. F. Monteith Ogilvy, Ledaig, Argyllshire, N.B., together with a letter in which it was stated that the contents of the packet had been taken from the crop of a Grey-hen (the female black grouse), shot on October 17th. The crop of the bird was found to be full of these "seeds" and an immense number of small black beetles; a few days later the crop of a Black-cock was found with similar contents. The supposed seeds, which were yellowish-green and smooth, proved to be the common spangle-gall of the oak leaf (*Neuroterus lenticularis*),

the characteristic hairs having been rubbed off. Again in December the contents of the crop of a Pigeon (a bird of the year), shot close to Pembroke, were received at Kew through the Board of Agriculture and Fisheries, and in this case also the crop contained a large quantity of the common spangle-gall.

Hymenanthera novae-zelandiae, *Hemsl.*—The Norfolk Island *Hymenanthera latifolia*, Endl., was founded (*Prodr. Fl. Ins. Norf.* 1833, p. 70) on specimens collected by Ferdinand Bauer. In 1863 Mr. Henry H. Travers visited the Chatham Islands and made a collection of dried plants, published by Baron Mueller in 1864 under the title of *The Vegetation of the Chatham Islands*. Among these plants was a species of *Hymenanthera*, which Mueller named *H. latifolia* var. *chathamica*, remarking that "the specimens brought by Mr. Travers are fruit-bearing and correspond fully to Endlicher's description and Bauer's illustration (Endlicher, *Iconographia Genera Plantarum*, 1838, t. 108), with the exception of the margin of the leaf which is toothed by short regular notches." A portion of Travers's material was sent to Kew and unfortunately the name was erroneously transcribed *H. latifolia* var. *tasmanica*. In 1868 the late Mr. Thomas Kirk transmitted to Kew specimens of a *Hymenanthera* collected in Flat Island, one of the numerous islands east of Auckland, for the purpose of having it compared. From the manuscript records of that date it appears that he was furnished with the name *H. latifolia* var. *tasmanica* for the Flat Island plant, which means that it was identified with the Chatham Islands specimen bearing the erroneous name. Not finding any publication of this name, Kirk accepted it and described his plant (*Trans. N. Zeal. Inst.* 1871, vol. iii., p. 163) without any remark respecting its inappropriateness. As to affinities, he says : "var. *chathamica* appears to differ from our plant only in the leaves being much narrower at the base and more deeply serrated, and in the larger fruit."

The point of importance here is that whoever made the comparison at Kew was of opinion that the Chatham and Flat Island specimens were specifically the same, and the differences are so slight that we should regard them as individual rather than varietal. However, both Kirk (*The Student's Flora of New Zealand*, 1899, p. 45) and Cheeseman (*Manual of the New Zealand Flora*, 1906, p. 50) deal with them as independent species, and both agree in stating that there is little to separate them.

Both authors also agree in casting some doubt on the correctness of the identification of the New Zealand plant with *H. latifolia*, Endl., from Norfolk Island, Cheeseman observing that "it must not be considered as proved until specimens from both localities have been compared."

In connection with the Illustrations of New Zealand Plants announced, p. 92, such a comparison has been made. Kew possesses ample material of the Norfolk Island plant, including a specimen collected by Bauer, on whose specimens and drawings Endlicher founded his species.

There is also a specimen of *H. latifolia* in the Herbarium from a plant cultivated at Kew before 1864. It may be mentioned,

parenthetically, that most likely neither Kirk nor Cheeseman had access to Endlicher's *Iconographia* cited above, as neither refers to it. But with complete specimens and drawings of the Norfolk Island and New Zealand plants before me, I have no hesitation in viewing them as distinct species. *H. latifolia*, Endl., has relatively slender branches; thin entire leaves, much more finely reticulated than Bauer's drawing represents them; smaller flowers, and the staminal appendages are only fringed at the tips instead of minutely toothed all round the margin.

Further investigation brought to light the fact that Allan Cunningham's *Scaevola novae-zelandiae*, reduced to *Hymenanthera crassifolia*, Hook. f. (*Fl. Nov. Zel.* 1852, vol. i., p. 17), is the same plant. Cunningham, therefore, was the discoverer, and he collected it at Mataun on the sea coast opposite the Cavallos Isles, in 1834. The name is now usually written Cavalli, and these islands are situated to the north-west of the Bay of Islands. Mataun does not occur in the gazeteers consulted.

Cunningham, it may be added, had only imperfect specimens, and although he describes the fruit, none is preserved with the type specimens at Kew.

Accepting Cunningham's name for this interesting plant, the synonymy would be as follows :—

Hymenanthera novae-zelandiae, *Hemsl.*

Scaevola ? novae-zelandiae, A. Cunn. in *Ann. Nat. Hist.* 1839, vol. ii., p. 52.

Hymenanthera crassifolia, Hook. f., *Fl. Nov. Zel.* 1852, vol. i., p. 17, quoad specimen Cunninghamianum.

Hymenanthera latifolia var. chathamica, F. Muell., *Vegetation of the Chatham Islands*, 1864, p. 9.

Hymenanthera latifolia var. tasmanica, Kirk in *Trans. N. Zeal. Inst.* 1871, vol. iii., p. 163.

Hymenanthera chathamica, Kirk in *Trans. N. Zeal. Inst.* 1896, vol. xxviii., p. 514; *Student's Flora of New Zealand*, 1899, p. 45.

Hymenanthera latifolia, Kirk, *Student's Flora*, p. 45; Cheeseman, *Manual of the New Zealand Flora*, 1906, p. 50, non Endlicher.

The specimens of *Hymenanthera* collected in Lord Howe Island have hitherto been referred to *H. latifolia*, Endl., but they belong to *H. novae-zelandiae*, differing from the New Zealand specimens in having apparently thinner leaves, as seen in the dried condition, at least. The flowers are exactly the same.

In connection with this investigation it became necessary to look at the very closely allied genus *Melicytus*, and this led to the discovery that *Hymenanthera oblongifolia*, A. Cunn. (*Hook. Lond. Journ. Bot.* 1842, vol. i., p. 124), is the same as Norfolk Island specimens collected by Milne, Backhouse, and others, and referred to *Melicytus ramiflorus*, Forst., though whether they are really the same species is doubtful. *H. oblongifolia*, A. Cunn., is referred, in the *Index Kewensis*, to the very different *H. dentata*, R. Br., but we have not discovered on what authority, the name not being taken up in Bentham's *Flora Australiensis*.

W. B. H.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3.] [1908.

XV.—THE NEW ZEALAND SPECIES OF RHODOPHYLLIS.

A. D. COTTON.

The New Zealand species of *Rhodophyllis* are not numerous, nor are they difficult to determine, yet, during recent years, workers in that country have found it no easy task to identify their plants, and practically impossible to reconcile statements made by different writers. This difficulty may be accounted for (1) by the brevity of the diagnoses, and, (2) by the fact that Nos. 371–373 of Harvey's Australian Algae were sent out wrongly named. J. Agardh who, in his Epicrisis, endeavoured to correct Harvey's Algae did but make matters more complicated.

The Kew Herbarium is fortunate in possessing type specimens of all the five species that were originally recorded as occurring in New Zealand. From a study of these it has been possible to gain a clear idea of the species in question, and to detect the errors above referred to. The results of this study are given below.

In the revised descriptions emphasis is laid on the arrangement of the cortical cells. The character of this tissue will be found to be of great value, especially in the case of sterile specimens, in determining the species. Attention may also be directed to the fact that the size of the tetrasporangium varies considerably within the genus; this, though apparent in the case of the New Zealand species, is even more marked when a wider survey of the genus is taken.

In addition to an examination of the Kew and British Museum specimens, the writer has had the advantage of studying the material in the Herbarium of Mr. R. M. Laing which he kindly sent from Christchurch, N. Z. This collection proved valuable in supplying data as to distribution, and also contained a species hitherto undescribed.

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The following is a revised description of all the species known to occur in New Zealand.

1. **Rhodophyllis acanthocarpa,** J. Ag. Epic., 1876, p. 364 ; De Toni Syll. Alg., 1897, vol. iv., p. 343 ; Laing Rev. List, in Trans. New Zeal. Instit., 1901, vol. xxxiv., p. 341.

Callophyllis acanthocarpa, Harv. in Hook. Fl. New Zeal., 1855, vol. ii., p. 251.

Calliblepharis? tenuifolia, Harv. in Hook. Fl. New Zeal., 1855, vol. ii., p. 243.

Fronds membranous, of medium size, irregularly dichotomously branched, rosy crimson. Main branches 1–3 cm. wide, linear oblong, margins entire or becoming fimbriate later ; ultimate branches 5 mm. wide, apices usually obtuse. Thallus composed of two distinct layers, an inner of large cells two or more deep arranged parallel to the surface of the frond, and an outer consisting of a single layer of small cells ; from above a rosulate-areolate arrangement is seen, in which the circle of minute cells surrounding the central one appears sub-prominent. Veins absent. Cystocarps marginal, aculeate. Tetrasporangia zonately divided, scattered near the apices of the frond, of medium size 30–50 × 20μ.

Hab. Middle Island on *Ascidia, Lyall ;* Jacobs River, *Sinclair ;* Chatham Islands (teste Agardh).

In Flora New Zealand, vol. ii., p. 251, Harvey stated that he was not clear as to the validity of this species, and feared that it might prove to be but a variety of *Callophyllis Hombroniana.* This may be accounted for by the fact that in Lyall's gatherings quoted by Harvey, both species are to be found, and that he did not detect that the true *C. acanthocarpa* possessed a *Rhodophyllis* structure. The two plants are in reality quite distinct and may be recognised even in the sterile state by the structure of the frond. *Callophyllis* may always be distinguished from the present genus by the uniform cortical layer of very minute cells.

The type specimen of *Calliblepharis? tenuifolia*, Harv., which is at Kew, proves to be but a somewhat luxuriant and proliferous example of *Rhodophyllis acanthocarpa.* The plant has the aspect of *Calliblepharis ciliata*, Kütz., but the structure of the frond and the form of the tetraspores are those of *Rhodophyllis.*

On account of the possession of aculeate cystocarps, *R. acanthophora* is not liable to be confounded with any other species except *R. Laingii* (q.v.)

2. **Rhodophyllis Laingii,** *Cotton*, sp. nov.

R. acanthocarpae similis sed frondibus crassioribus, et aspectu distinctissimo rosulato-areolato differt.

Species submembranacea, ampla, pinnatim ramosa. Rami 1–2 cm. lati, vix attenuati, obtusi, margine ut videtur integro, aut in plantis cystocarpiferis dense fimbriato. Frons duobus distinctis cellularum stratis contexta, cellulis interioribus majoribus per duas series frondis plano parellelas dispositis, cellulis corticalibus minutis, aspectu rosulato-areolato a superficie. Venae

nullae. Cystocarpia ad basin fimbriarum, prominula, echinata fimbrillis indivisis vel multifidis. Tetrasporangia ignota. Color roseus.

Hab. Timaru, *Laing*, 1245.

The above diagnosis is founded on a single but very fine specimen sent by Mr. Laing. Allied to *R. acanthocarpa*, J. Ag., in its structure and aculeate cystocarps, *R. Laingii* differs from that species in possessing larger and thicker fronds, together with a more clearly marked rosulate-areolate arrangement of the cortex. The degree and manner of branching would also appear to be somewhat different from that species, though until more material is forthcoming it is impossible to speak definitely as to this. In the specimen examined there is one main frond, about 2 cm. in width, which branches in a simple pinnate manner; the lateral branches are about 1 cm. in width, and attain a length of 7–8 cm.

3. **Rhodophyllis membranacea**, Harv. in Hook. Fl. New Zeal., 1855, vol. ii., p. 247, t. 117; Kütz. Tab. Phyc., 1869, vol. xix. t. 53? J. Ag. Epic., 1876, p. 365; De Toni Syll. Alg., 1897, vol. iv., p. 344, partim; Laing Rev. List, 1901, p. 341; non Harv. Austral. Exsicc. Nos. 371–373.

Halymenia membranacea, Harv. in Lond. Journ. Bot., 1844, vol. iii., p. 448.

Rhodymenia membranacea, Harv. in Lond. Journ. Bot., 1847, vol. vi., p. 495.

Stichophyllum membranaceum, Kütz. in Bot. Zeit., 1847, vol. v., p. 1; Kütz. Spec. Alg., 1849, p. 874.

Euthora membranacea, J. Ag. Spec. Alg., 1852, vol. ii., p. 385.

Dictyopsis fimbriata, Sond. in Linnaea, 1855, vol. xxvi., p. 519.

Frond membranous, of medium size, up to 15 cm. long, irregularly decompound pinnate, subflabellate, red to fuscous red. Root fibrous. Main branches 5–10 mm. wide, irregularly pinnate, margins frequently fimbriate; pinnae narrow, irregularly alternate; ultimate pinnae linnear-oblong, sub-acute, rarely attenuated at the base; axils of branches and pinnae rounded. Thallus composed of two more or less distinct layers, an inner of large cells two or more deep arranged parallel to the plane of the frond, and an outer consisting of an imperfect layer of smaller cells; rosulate-areolate appearance not shown from above; entire thallus densely punctate with small cells containing red-brown contents. Veins absent. Cystocarps of medium size, marginal Tetrasporangia zonately divided, scattered, or more or less collected into groups near the apices of the ultimate pinnae, very large $70 \times 30\mu$.

Hab. Cook's Straits, *Lyall;* East Coast, *Colenso;* Timaru, *Laing*, 1248; Chatham Islands, *Maltby*.

As a result of *R. membranacea*, Harv., being wrongly united with *R. fimbriata*, Harv., and still more so by Harvey's Australian Exsiccatae being sent out wrongly named, this species has become unrecognisable.

The history may be briefly stated as follows. The original Tasmanian specimens (Gunn, No. 1276) sent to Sir W. Hooker

were described by Harvey as *Halymenia membranacea* (1844). A specimen is preserved at Kew. Harvey in his description noted the dot-like markings but regarded them as tetraspores, a mistake which he himself pointed out later. In 1847 when compiling his list of Tasmanian Algae he records the plant as *Rhodymenia membranacea*. Kützing, in the same year, having seen an authentic specimen, considered it the type of a new genus, and named it *Stichophyllum membranacea*. This name he retained in his Species Algarum in 1849. In the Flora of New Zealand (1855) Harvey records the plant as gathered by Lyall and Colenso in that country; specimens from both of these collections are at Kew, and they agree in all respects with the type specimen from Tasmania. Harvey's description and figure in Fl. New Zeal. is excellent. Up to this date there is no difficulty. In 1860, however, Harvey in Flora Tasmaniae united *R. fimbriata* with *R. membranacea*. This was an error. *R. fimbriata*, Harv. and Hook., though resembling in appearance certain forms of *R. membranacea*, shows a different structure in that it possesses veins and has no dark cells. About the same time Harvey's Australian Algae were issued. In this magnificent series *R. membranacea* is particularly unfortunate. No. 372, in reality *R. tenuifolia*, is labelled *R. membranacea* (Kew and British Museum specimens examined). This was possibly an accident arising from the similarity of meaning in the two names. No. 371, bearing the same label, consists of *R. fimbriata & R. Gunnii*, Harv.; whilst 373, named *R. membranacea* var. *elongata*, Harv., may possibly be a variety of *R. fimbriata*, but is certainly not one of *R. membranacea*.

In 1876 J. Agardh published his Epicrisis and detecting inconsistencies in previous work endeavoured to put matters straight. He rightly removes *R. fimbriata* from *R. membranacea*, but wrongly, in the opinion of the writer, unites it with his own species *R. ramentacea*. For *R. membranacea* he quotes Harvey's Australian Algae Nos. 372 and 373, and apparently takes these as his guide in describing the species. Consequently he finds himself at variance with Harvey's figure and diagnosis in Fl. New Zealand, and therefore excludes it from his description. Basing his diagnosis on two exsiccatae, neither of which represented the plant in question, it is little wonder that he went astray. Later writers have accepted Agardh, and the plant has thus been lost sight of.

The brown colour, shaggy habit, and punctate thallus are good macroscopic characters by which to recognise the present species. In structure it approaches *R. Gunnii*, but is separated from it by the characters noted under that species.

R. membranacea appears to be abundant on various parts of the New Zealand Coast, and also in the Chatham Islands. Australian and Tasmanian species are not numerous in European Herbaria.

4. Rhodophyllis Gunnii, Harv. in Fl. New Zeal., 1855, vol. ii., p. 247; J. Ag. Epic., 1876. p. 366; De Toni Syll. Alg., 1897, vol. iv., p. 345; Laing Rev. List, 1901, p. 341.

Laurencia? membranacea, Harv. in Lond. Journ. Bot., 1844, vol. iii., p. 443.

Cladhymenia? Gunnii, Harv. in Lond. Journ. Bot., 1845, vol. iv., p. 540 ; Ner. Austral., 1847, p. 87, t. 32 (inexacte) ; Kütz. Tab. Phyc., 1867, vol. xvii., t. 94.

Callophyllis Gunnii, Kütz. Spec. Alg., 1849, p. 746.

Enthora Gunnii, J. Ag. Spec., 1852, vol. ii., p. 386.

Frond very delicate, membranous, large, up to 20 cm. long, pinnate to compound pinnate, pale rosy purple. Main branches 2–3 cm. wide, deeply pinnate or bipinnate, margins entire rarely fimbriate, apices obtuse. Pinnae irregularly alternate, distichous ; lower ones small, narrow, pointed : upper longer, often compound, apices obtuse. Thallus-structure similar to that of *R. membranacea*, cortex poorly developed, rosulate-areolate arrangement not visible, slightly punctate with cells containing brown colouring matter. Cystocarps marginal. Tetrasporangia zonately divided scattered in the upper segments of the frond, large, 70 × 30μ.

Hab. Preservation Harbour, Chalky Bay, *Lyall*.

The greater size, more delicate texture, and blunt apices usually suffice to distinguish this plant from *R. membranacea*. It is, however, allied to that species and closely resembles it in microscopic characters. The poorly developed cortex, the absence of an areolate arrangement, the large tetraspores, and the presence of dark cells are all in agreement with *R. membranacea*. The dark cells in the present species are, however, less abundant and usually of larger size. In both species these bodies are more obvious in some specimens than in others.

5. **Rhodophyllis lacerata**, Harv. in Hook. Fl. New Zeal., 1855, vol. ii., p. 247 ; J. Ag. Epic., 1876, p. 366 ; De Toni Syll. Alg., 1897, vol. iv., p. 345, sub *R. membranacea*, Harv ; Laing Rev. List, 1901, p. 341.

Frond very delicate, membranous, of medium size, rosy crimson. Branches 1–3 mm. wide, elongated, entire, pinnate or dichotomous ; ultimate branches 1–2 mm. wide, linear, very elongated, apices acute, often bifid ; axils of branches rounded. Thallus composed of two distinct layers, an inner of large cells, two or more deep, arranged parallel to the surface of the frond, and an outer consisting of a single layer of small cells ; a rosulate-areolate arrangement is seen from above. Veins absent. Cystocarps and tetrasporangia unknown.

Hab. On rocks, Port William, South Island, *Lyall;* Otago Harbour, *Laing*, 1246.

This plant remains little known. The only previous record is that of the single specimen gathered by Lyall which is now at Kew. The vegetative structure is identical with that of *Rhodophyllis*, and resembles very closely that of *R. acanthocarpa*. There is little doubt that the specimen represents an attenuated form, similar to those that are frequently produced in species of *Nitophyllum*. What the character of the normal form is it is impossible as yet to say, the only known species to which it in any way approaches is, as stated above, *R. acanthocarpa*, J. Ag.

Laing's specimen is precisely similar to that of Lyall, and is also sterile.

Species Exclusae.

Rhodymenia fimbriata, Hook. & Harv. in Lond. Journ. Bot., 1847, vol. vi., p. 405.

Rhodymenia fimbriata, Hook. & Harv., though a true *Rhodophyllis*, has never been published as such. It was included by J. Agardh as one of the synonyms of the New Zealand *R. membranacea*, but it is, as shown above, quite a distinct species. There is no evidence to prove that *Rhodophyllis fimbriata* (nov. comb.) occurs in New Zealand.

Rhodophyllis ? angustifrons, Harv. in Hook. Fl. New Zeal., 1855, vol. ii., p. 247 ; J. Ag. Epic., 1876, p. 368 ; Laing Rev. List, 1901, p. 311.

An examination of the type specimens shows that the frond possesses the structure of the genus *Callophyllis*. The plant is probably an elongated form of *C. coccinea*, Harv.

Rhodophyllis erosa, J. Ag. Alg. Mar. Nov. Zeal., 1877, No. 182 ; Epic. 1876, p. 695 ; Laing Rev. List, 1901, p. 341. A species now known as *Craspedocarpus erosus*, Schmitz.

Rhodophyllis chathamensis, Cotton, Kew Bull., 1907, No. 2, p. 40.

This species also must be regarded as a synonym of *Craspedocarpus erosus*, Schmitz.

The genus *Craspedocarpus* was separated from *Rhodophyllis* by Schmitz (Syst. Uebers. Florid., p. 8 ; Engler Pflanzenfamilien Teil i., Abt. 2, p. 375) on account of certain structural peculiarities of the frond and cystocarp ; he refers to *Callophyllis erosa*, Harv., as a synonym. The original gatherings of the latter plant contain two, if not three, distinct species, viz. *Callophyllis Hombroniana*, Mont., *Craspedocarpus erosus*, Schmitz, and a third plant allied to *C. Hombroniana* but apparently distinct from it. The writer by not observing the double nature of the original New Zealand specimens, formed (Kew Bull. *l.c.*) the new species *Rhodophyllis chathamensis*.

XVI.—BANANA CULTIVATION IN EGYPT.

Mr. T. W. Brown, whose appointment as Secretary of the newly formed Horticultural Society at Ghizeh near Cairo was recorded last year (*K.B.*, 1907, No. 1, p. 18), has kindly sent us the following article on the cultivation of bananas in Egypt. If the industry is at all likely to meet with the measure of success there indicated it would appear to be worthy of serious consideration.

Although bananas have long been grown in Egypt it is only within recent years that their cultivation has been carried on systematically in large plantations. This was owing greatly to the fact that all the kinds known in the country were of tall

growth and unable, when planted in the open, to withstand the north winds which tear the leaves to shreds in winter. It is therefore the custom to plant these tall varieties in the shelter of a wall, where in most cases they are left to take care of themselves. The most common kinds grown in this way are those known locally as the "Beledi" and "Americani." The former is a black-stemmed variety of *Musa sapientum*, growing about 5 metres high and producing a thick, round and rather short fruit of excellent quality. The "Americani" is a form of the plantain (*M. paradisiaca*) common throughout the tropics. In Egypt it is usually eaten by the natives as a sweet banana without being cooked. In height and habit it resembles the "Beledi" but is easily distinguished by its light-coloured stem. The fruit is from 25–30 cm. long and is produced in large bunches which require to be supported on forked poles to prevent the stems being broken by the weight.

The Lady's Finger banana (another variety of *M. sapientum*) is also grown to a small extent in Egypt but the fruit is inferior in quality to that of the "Beledi" and is seldom seen in the market.

M. Ensete and *M. rosacea* are occasionally met with in gardens as ornamental plants.

From a commercial point of view however the most important species is the Chinese banana. This, although of comparatively recent introduction, is now common throughout the country. Owing to its dwarf growth it is much less subject to injury from the north wind which prevails in winter. In fact it is the introduction of this species which has made the cultivation of bananas on a large scale practicable in Egypt. No figures are available as to the area of land at present devoted to the crop, but plantations ranging from one to twenty feddans* exist in the province of Galioub, and in the vicinity of Alexandria, &c. The amount of fruit is not however sufficient to supply even the home markets. Considerably more than £E. 13,000 worth of bananas were imported during the year 1906. The growth of the industry was arrested some three or four years ago by the attacks of an eel-worm in the plantations at Alexandria. Fortunately this pest has almost disappeared and will probably give little further trouble, if a systematic course of transplanting is followed and over-watering is avoided. On moderately light soils water is required every five or six days in summer and every nine or ten days in winter.

On good soil the plants may occupy the ground for six years.

The best growers prepare the ground for planting in the following way. After it has been ploughed, holes are dug three and a half metres apart, one metre wide and about 75 centimetres deep. A layer of coarse leaves or stable-manure 25 or 30 centi-metres in thickness is placed at the bottom of the hole, which is then filled to near the top with a compost half of manure and half of soil. The land is then irrigated, and three or four days afterwards one sucker is planted in the centre of each hole. After planting, the soil is so disposed that each row of bananas stands

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* One feddan = 4,200 square metres.

in the middle of a shallow trench about one and a half metres wide. The water is thus distributed evenly between and around the plants. Needless to say, the stronger the suckers are when planted the more quickly is the plantation established.

The best time for planting is from the middle of February until the middle of April.

In the choice of a site for a plantation the main point is to see that it is sheltered. Although there are some excellent plantations growing in the interior without shelter, and the plants quickly recover in spring from any injury received in the winter, it is nevertheless desirable that the damage may be as slight as possible; otherwise the size of the bunches is greatly diminished. If the situation is not naturally sheltered, this is easily remedied by planting wind-breaks of the common *Casuarina* (*C. equisetifolia*). Some growers bend part of the leaves over the heart of the plant as a further protection from the slight frosts which sometimes occur in December and January.

In the matter of soil the banana is not particular, but grows equally well on yellow or on black loam, provided it is well drained and cultivated. Experiments made in growing bananas in specially prepared holes on the sandy ground at the edge of the desert have not hitherto succeeded.

The cost of establishing a plantation varies, of course, according to the distance which the manure has to be transported, and the rate of wages paid to the workmen. If we reckon 1*s.* per day as the rate of wages of the men who do the heavy work, and 7½*d.* per day for the boys who carry the manure, suckers, &c., it works out at about £12 15*s.* per feddan. This is made up as follows:— Labour, including ploughing, £4 12*s.* 6*d.*; cost and transport of manure, £1; cost of 342 suckers at 5*d.* each, £7 2*s.* 6*d.* As the plants multiply rapidly the last item may figure on the estimates for the first year only, suckers for subsequent plantations being taken from that first formed. The cost of establishment is then reduced to about £6, including the expense of digging the suckers. During the first summer and winter, catch-crops of cucumbers, water melons, French beans, tomatoes, &c., are grown between the rows, the returns from these being sufficient to cover the initial expenditure and the cost of upkeep until the bananas come into bearing. In plantations started in February and March the first bunches are cut in December, the majority of the bunches are however not ready for cutting until the following February. During the second and subsequent years it is usual to leave four fruiting stems to each plant. These should be as far as possible of different ages, so that all the fruit may not be produced at the same time.

The cultivation of bananas in Egypt is at the present time extremely lucrative. Sold on the plants, they bring from £80 to £120 per feddan per year. If cut and sold by weight, when green, the minimum wholesale price is 8¾*d.* per oke.* Putting the minimum weight of the bunches at four okes, four bunches to the clump per year, and 342 clumps to the feddan, a short calculation

* One oke = 2 lbs. 12 ozs.

will suffice to show that enormous profits are derived from this crop, even when we reckon £35 as the cost of upkeep. Counting £15 for rent, and £6 per feddan for water, the above figure allows £14 for labour, manure and other expenses. This of course is a high estimate. If the soil is at all poor the plants require two dressings of stable-manure per year—in February and again in July. If it is rich loam one good application of manure suffices. As we have already pointed out, the amount of bananas produced in the country is not sufficient to meet the local demand. Enquiries made during the past year in various Mediterranean ports show that there is a great market for Egyptian bananas, waiting to be developed in Southern Europe. There is therefore little danger of over-production for many years to come.

The short distance and the excellent means of transport existing from Egypt to the principal European ports, would make competition with the Canary Islands comparatively easy. The quality of the fruit is superior to that from the Canaries, and was competing successfully even in France, before the appearance of the disease already referred to. The area under cultivation is increasing fast, so that the banana crop will probably be a much more important one in Egypt in the near future than it is at present.

T. W. Brown.

XVII.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECADES XLVII-XLVIII.

461. **Geunsia Havilandii**, *King et Gamble* [Verbenaceae]; a *G. farinosa*, Blume, caulibus foliisque fulvo-stellato-pubescentibus non farinosis etiam cymis subsessilibus differt.

Arbor?; rami, ut inflorescentia et folia subtus, fulvo-stellato-pubescentes. *Folia* opposita, ovata vel ovato-oblonga, apice breviter acuminata et mucronata, basi acuta vel cuneata, supra praecipue in costa scabra et hispida, subtus rugosa, stellato-pubescentia et glandulis peltatis tecta, marginibus distanter denticulata, 6–15 cm. longa, 4–6 cm. lata, costa crassa prominente; nervi utrinque 9–11, nervulis transversis conspicuis inter se juncti; petioli crassi, fulvo-hispidi, 13–17 mm. longi. *Cymae* axillares, pauciflorae, subsessiles, vix petiolis aequilongae; bracteae minutae, subulatae; pedicelli breves, graciles. *Calyx* campanulatus, intus glaber, extra strigoso-hispidus; lobi 5, 1–1·5 mm. longi; fructifer persistens, complanatus. *Corolla* campanulata, glandulis peltatis lucidis exceptis, glabrescens; tubus 2·5 mm. longus; lobi 5, ovati, rotundati, demum recurvi. *Stamina* exserta, filamentis gracilibus, antheris oblongis, 2·5 mm. longis dorso fulvo-glandulosis. *Ovarium* glandulosum, depressum, stylo gracili 5 mm. longo, stigmate breviter 5-lobato. *Drupa* siccitate purpureo-nigra, depressa, 3·5 mm. diametro, 5-pyrena.

MALAY ISLANDS. Borneo; at Sarawak, *Beccari*, 3240; *Haviland*, 3549 K and L; near Kuching, *Haviland*, 889.

462. **Callicarpa Maingayi**, *King et Gamble* [Verbenaceae]; a *C. arborea*, Roxb., foliis obtusis subtus pilis minutioribus aureo-fulvis tectis, corollae tubo longiore et lobis brevioribus distincta.

Arbor; rami juniores tomento aureo-fulvo stellato minute tecti; ramuli crassi, obtuse quadrangulares. *Folia* coriacea, elliptica vel elliptico-obovata, apice rotundata et brevissime acuta vel acuminata, basi rotundata vel subcuneata, lateribus inaequalia, margine subintegra vel undulata, 15–30 cm. longa, 7·5–15 cm. lata; nervi supra impressi, subtus prominentes, utrinque 10–12, marginem versus anastomosantes, nervulis transversis pluribus regularibus; petioli 4–5 cm. longi, crassi, supra canaliculati. *Cymae* multiflorae, rotundatae, ad 8–9 cm. longae et 15 cm. latae; pedunculi crassi, complanati, 2·5–4 cm. longi; bracteae brevissimae, lineari-subulatae; pedicelli 1–2·5 mm. longi, graciles. *Calyx* hemisphaericus, 1–1·5 mm. longus, extra stellato-pubescens, intus glaber, lobis 4 minutis. *Corollae* tubus subcylindricus, 1–1·5 mm. longus, extra densissime stellato-tomentosus, intus glabrescens; lobi breves, rotundati, 1 mm. longi, intus villosi. *Stamina* prope basin tubi inserta: filamenta 4·5 mm. longa, antheris dorso glanduloso-punctatis. *Ovarium* villosum; stylus gracilis, stigmate capitato. *Drupa* parva, nigra, ad 1·5 mm. diametro.

MALAY PENINSULA. Selangor, *Ridley*, 2787; Malacca, *Maingay*, K.D. 1192; *Derry*, 1005.

463. **Callicarpa angustifolia**, *King et Gamble* [Verbenaceae]; inter species peninsulae Malayanae ob folia angusta distincta; ad *C. angustam*, Schauer, speciem insularum Philippinensium magis accedit, sed foliis vix denticulatis et floribus et fructu majoribus differt.

Arbuscula ad 3 m. alta; ramuli, ut inflorescentia et folia subtus, indumento stellato griseo vel ferrugineo adpresso tecti; ramuli obscure quadrangulares. *Folia* subcoriacea, lanceolata, apice attenuate acuta, basi longe attenuata et in petiolo decurrentia, supra glabra, fusca, infra dense griseo-tomentosa, marginibus integra vel aliquanto perobscure denticulata, recurva, 10–18 cm. longa, 2–4 cm. lata, costa crassa, nervis utrinque 9–15 irregularibus, nervulis transversis pluribus; petioli 1·25–2 cm. longi. *Cymae* longae, pauciflorae; bracteae lineari-subulatae; pedicelli brevissimi, articulati. *Flores* caeruleo-punicei. *Calyx* campanulatus, 2 mm. longus, extra dense stellato-tomentosus, intus glaber; lobi mucronulati. *Corolla* calyce duplo longior, extus dense stellato-tomentosa, intus glabra; lobi rotundati, erecti. *Stamina* ad basin tubi inserta: filamenta gracilia, vix exserta, antheris oblongis, utrinque glanduloso-punctatis. *Ovarium* villosum, stylo gracili exserto, stigmate capitato. *Drupa* glabra, globosa, 2·5 mm. diametro, nigro-caerulea, 4-pyrena.

MALAY PENINSULA. Kedah; on Lankawi island, *Ridley*, 8330. Perak; at Ipoh, *Curtis*, 3197; at Batu Kuran, *Scortechini*, 1596; on the top of limestone hills, at 200 to 300 m., *King's Collector*, 7036, 8236.

464. **Premna littoralis**, *King et Gamble* [Verbenaceae]; inter species peninsulae Malayanae foliis prominenter crenato-dentatis deltoideis cordatis insignis.

Arbor parva; ramuli obscure angulati, fulvo-pubescentes. *Folia* chartaceo-coriacea, ovata vel ovato-deltoidea, apice acuminata, basi cordata, sinu 6–12 mm. profundo; supra et infra nervis exceptis glabra, marginibus sinibus exceptis acute crenato-dentata, 10-15 cm. longa, 5–7·5 cm. lata, costa prominente; nervi utrinque 7–9, inferiores 1–2 a basi divaricati, nervulis transversis paucis; petioli 2–4 cm. longi, graciles, puberuli. *Cymae* terminales, corymbosae, 3-chotomae, fulvo-pubescentes, ad 10 cm. longae et 15 cm. latae; pedunculi 2–2·5 cm. longi; bracteae lineares, persistentes, inferiores aliquanto foliosi; pedicelli brevissimi, bracteolis 2 minutis juxta calycem. *Calyx* 2–2·5 cm. longus, extra pubescens, bilabiatus, labio superiore 3-lobo, inferiore 2-lobo. *Corolla* bilabiata, calyce dimidio longior, intus ad faucem tubi dense villosa; labium superum 2-lobum; inferum 3-lobum, lobis omnibus rotundatis. *Stamina* inclusa, filamentis brevibus, antheris reniformibus brevissime 1–2-mucronatis. *Ovarium* subglobosum, depressum, glandulis paucis exceptis glabrum, stigmate bifido. *Drupa* globosa, glabra, carnosa, putamine tuberculato. *Semina* oblonga, utrinque acuta; testa membranacea; cotyledones oblongae, obtusae, cordatae, carnosae, 1·25 mm. longae.

Malay Peninsula. Perak, sea-coast at Matang, *Wray*, 2719.

465. **Premna Derryana**, *King et Gamble* [Verbenaceae]; a *P. interrupta*, Wall., ex Himalaya orientali, paniculas 3–4-spicatas gerentibus et foliis basi subauriculatis differt.

Frutex scandens (?); ramuli teretes, lenticellis rotundis vel ellipticis praediti. *Folia* siccitate membranacea, integra, subsessilia, elliptica vel obovata, apice breviter et obtuse acuta, basi attenuata, subauriculata, utrinque lucentia, glabra, 13–20 cm. longa, 9–10 cm. lata, costa gracili; nervi utrinque 7–8, saepe ramulosi, marginem versus curvati, venulis transversis gracilibus prominentibus. *Cymae* in paniculas terminales 3–4-spicatas dispositae; spicae singulae flores sessiles multos in glomerulis interruptis gerentes. *Inflorescentia* 15–20 cm. longa: pedunculi primarii 5–6·5 cm. longi, secundarii 2–2·5 cm. longi; bracteae lanceolatae, 6 mm. longae. *Calyx* profunde bilabiatus; labium superius in alabastro integrum, deinde bilobum; inferius integrum; tubus extra aureo-pubescens. *Corollae* tubus quam calyx paullo longior; extus glaber, intus ad faucem parce albo-villosus; limbus bilabiatus; labium superum emarginatum, erectum; inferum 3-lobum, lobis obtusis. *Stamina* 4, longe exserta; filamenta puberula; antheris reniformibus, loculis oblongis. *Ovarium* glabrum, depressum, stylo gracili staminibus aequilongo, stigmate bilobo lobis gracilibus horizontalibus. *Drupa* non visa.

Malay Peninsula. Perak; on Larút Hill, *Derry* (*Curtis* 3701).

466. **Premna perakensis**, *King et Gamble* [Verbenaceae]: a *P. trichostomate*, Miq., foliis angustioribus crassioribus, calyce fructifero eximie nervoso et bracteis majoribus distincta.

Frutex scandens; ramuli teretes, glabri, lenticellis paucis. *Folia* chartaceo-coriacea, elliptico-oblonga vel lanceolata, aliquanto obovata; apice acuta, basi subcuneata, utrinque glabra, paullo rugosa, marginibus integra recurva, 7–13 cm. longa, 4–6 cm. lata; nervi utrinque 5–6, supra impressi, subtus prominuli, nervulis transversis pluribus inconspicuis; petioli 1–2 mm. longi, glabri, supra canaliculati. *Corymbi* patentes, fulvo-puberuli, 15 cm. longi et lati, imprimis 3-chotomi deinde 2-chotomi, sessiles vel pedunculis crassis 5–8 cm. longis instructi; bracteae ovato-lanceolatae, inferiores foliosae; pedicelli et flores viridescentes. *Calyx* obtuse quadrangularis, pubescens, nervosus, 1–5 mm. longus, bilabiatus labio superiore bilobo, inferiore integro vel obscure bilobo. *Corolla* infundibularis; tubus 3 mm. longus, in parte superiore dense albo-villosus, subaequaliter 4-lobus, lobis recurvis, ciliatis. *Stamina* ad basin corollae inserta, longe exserta, filamentis complanatis; antherarum loculis subglobosis didymis, connectivo glanduloso. *Ovarium* glabrum, stylo longe exserto, stigmate divaricate bifido. *Drupa* pyriformis. *Semina* ovali-oblonga, complanata.

Malay Peninsula. Perak, in rocky places in forest at 260 to 300 m., *King's Collector*, 7247, 10738; *Scortechini*, 516.

467. **Premna Wrayi**, *King et Gamble* [Verbenaceae]; foliis coriaceis ellipticis acuminatis et corymbis compactis insignis, ad *P. Kunstleri*, King & Gamble, q.v. infra, accedit sed calyce profunde bilobo differt.

Frutex scandens, glabratus; ramuli crassi, obscure quadrangulares. *Folia* coriacea, elliptica vel elliptico-lanceolata, apice sensim acuminata, basi attenuata, saepe inaequalia, utrinque lucentes, praeter pilos in axillis nervorum congestos glabra, integra, 10–20 cm. longa, 5–10 cm. lata; nervi utrinque 6–8, marginem versus curvati, nervulis transversis rectis regularibus; petioli 1–5 cm. longi, supra canaliculati. *Corymbi* densi, compacti, 10–13 cm. diametro, glabrati vel minutissime puberuli; rami inferiores 3-chotomi, superiores 2-chotomi; pedunculus 2·5 cm. longus, crassus; bracteae minimae, lineares, inferiores foliosae; pedicelli 1·25 mm. longi. *Calyx* profunde bilabiatus; labium superum breviter bilobum; inferum 3-dentatum, lobis in fructu patentibus. *Corolla* non visa. *Drupa* obovoidea, 5–6 mm. diametro, putamine rugoso, glanduloso. *Semina* plano-convexa, ovata, 4·5 mm. longa; cotyledones oblongae, carnosae.

Malay Peninsula. Perak; at Tapa, *Wray*, 200.

468. **Premna sterculiifolia**, *King et Gamble* [Verbenaceae]; foliis magnis ovatis membranaceis siccitate rubidis basi truncatis vel cordatis insignis, *P. cordifoliae*, Roxb., affinis sed ab ea corymbis multo majoribus differt.

Frutex elatus, scandens; ramuli teretes, rufescentes, sparse scabrido-puberuli. *Folia* membranacea, ovata, integra, apice acuminata, basi truncata vel paullo cordata, utrinque siccitate rubida, subtus sparse glanduloso-punctata, 10–23 cm. longa, 8–13 cm. lata; costa prominens, supra canaliculata; nervi utrinque 6, subtus prominentes, paria 2 infera a basi patentia, reliqua apicem versus sensim curvata, nervulis pluribus transversis; petioli 5–10 cm.

longi, supra canaliculati. *Cymae* multiflorae, terminales, in corymbis paniculatis magnis patentibus usque ad 23 cm. longis et 20 cm. latis dispositae ; cymulae ultimae congestae ; bracteae lineares, minimae, caducae ; pedicelli breves, graciles. *Flores* pallide viriduli. *Calyx* campanulatus, obscure bilabiatus ; labium superum integrum ; inferum integrum vel obscure dentatum. *Corollae* tubus infundibularis, puberulus, 3 mm. longus, intus ad faucem albido-villosus ; labium superum indivisum ; inferum 3-lobum. *Stamina* exserta, filamentis tortis, antheris ellipsoideis divaricatis. *Ovarium* glabrum, depressum, stylo gracili 6 mm. longo, stigmate bifido. *Drupa* globosa, depressa, siccitate rubra, tuberculata. *Semen* unicum perfectum, obovatum, 2·5 mm. longum ; testa membranacea ; cotyledones carnosae.

MALAY PENINSULA. Perak ; at Waterfall, *Wray*, 1828 ; *Scortechini* ; *King's Collector*, 3067, 7531, 8373.

Var. **cordata**. Folia basi magis profunde cordata ; inflorescentiae ramuli distantes ; calycis labium superum 2-lobatum ; inferum integrum vel obscure dentatum.

Perak ; *Scortechini*, 273.

469. **Premna Ridleyi**, *King et Gamble* [Verbenaceae] ; facie *P. integrifoliae*, Linn., affinis sed notis plurimis differt : corymbis parvis, calycis tubo subquadrangulari, lobis 4 et corollae tubo gracili.

Frutex scandens, cortice griseo-lucido ; ramuli teretes, fusci. *Folia* chartacea, integra, opposita vel ex utraque pari unum altius ; ovata, ovato-oblonga vel obovata, apice rotundata vel brevissime acuta, basi rotundata vel attenuata, saepe inaequalia, utrinque glabra, 4–7·5 cm. longa, 2–4 cm. lata ; nervi utrinque 6–7, infera 1–2 paria a basi, omnes marginem versus curvati, nervulis transversis reticulatione obscuris ; petioli graciles, 6–13 mm. longi. *Corymbi* terminales, multiflori, fusco-puberuli, 4–12 cm. longi, pedunculis 2–5 cm. longis ; bracteae parvae, lineari-lanceolatae ; pedicelli brevissimi. *Flores* albo-viriduli. *Calyx* campanulatus, subquadrangularis, pubescens, bilabiatus, labiis bilobis. *Corollae* tubus gracilis, 2·5 mm. longus, tubulosus, intus supra albo-villosus, infra puberulus ; lobi 4, aequales, oblongi, apice rotundati, tandem recurvi. *Stamina* 2 ad faucem corollae tubi, 2 basin versus inserta ; filamenta longe exserta ; antherae parvae, loculis divaricatis, connectivo dorso glanduloso. *Ovarium* glabrum, rotundatum ; stylus staminibus aequilongus, stigmate bifido lobis recurvis. *Drupa* non visa.

MALAY PENINSULA. Perak, *Scortechini*, 455. Singapore, *Ridley*, 6826.

470. **Premna Kunstleri**, *King et Gamble* [Verbenaceae] ; species distincta *P. Wrayi*, King et Gamble, affinis sed calyce truncato differt ; foliis coriaceis ellipticis obtusis glabris et corymbis magnis patentibus insignis.

Arbor parva vel arbuscula magna, glabra, interdum scandens ; rami crassi, cortice bruneo-purpureo ; ramuli teretes, glabri, raro lenticellati. *Folia* coriacea, elliptica, elliptico-oblonga vel obovata, apice obtusa, abrupte breviterque acuminata, basi rotundata

vel subcordata ; utrinque glabra, siccitate plus minus lucida, marginibus integra, breviter recurva, 10–18 cm. longa, 6–10 cm. lata ; costa crassiuscula, supra impressa, infra elevata ; nervi utrinque 5–7, infra prominentes, ad nervulum intramarginalem arcuatum curvati, nervulis perpaucis transversis ; petioli 1·5–3 cm. longi, teretes, canaliculati. *Corymbi* terminales, patentes, longe-ramosi, usque ad 18 cm. longi, infra 3-chotomi, supra 2-chotomi, glabrati ; pedunculi vel rami primarii 7–10 cm. longi ; bracteae lineares vel lineari-lanceolatae, inferiores foliosae ; pedicelli brevissimi. *Flores* pallide albo-virescentes. *Calyx* cupularis, 2 mm. longus, truncatus vel obscure bilabiatus, fructifer integer, complanatus. *Corollae* tubus cylindricus, 3 mm. longus, intus ad faucem albo-villosus ; limbus bilabiatus, labio infero 3-lobo, lobo medio longiore, ceteris cum unico superiore erectis vel incurvis. *Stamina* paullo exserta, sub fauce corollae tubi inserta ; antherarum loculis rotundatis divaricatis. *Ovarium* glabrum, 4-loculare ; stylus staminibus aequalis, stigmate breviter bifido. *Drupa* obovoidea, striata, 6 mm. longa, 4-pyrena. *Semina* obovata, plano-convexa. testa alba, cotyledonibus carnosis apice retusis.

Malay Peninsula. Perak ; on low ground, under 160 m. in alt, *King's Collector*, 938, 4723, 5949. Malacca ; at Sungei Udang, *Goodenough*, 1350.

471. Clerodendron lankawiense, *King et Gamble* [Verbenaceae] ; species *C. Griffithiano*, Clarke, affinis, sed foliis magis lanceolatis longioribus, paniculis terminalibus et calyce intus glanduloso differt.

Arbuscula ramulis scabrido-puberulis obtuse quadrangularibus sulcatis. *Folia* opposita, chartacea, integra, oblongo-lanceolata vel oblanceolata, apice acuta, basi attenuata, utrinque parce scabrido-hispida, infra ad nervos pubescentia, 7·5–10 cm. longa, 1–2·5 cm. lata ; nervi utrinque 8–10, marginem versus acute curvati, nervulis transversis paucis irregularibus ; petioli 6 mm. longi, scabride pubescentes. *Panicula* terminalis, foliosa, pedunculata, thyrsoidea, ad 25 cm. longa et 10 cm. diametro, scabride pubescens, in cymas paucifloras trichotomas desinens ; bracteae foliosae, lanceolatae ; bracteolae parvae, setaceae ; pedicelli graciles, 5 mm. longi. *Calyx* campanulatus, extus scabrido-hispidus, intus glandulis magnis peltatis instructus, ad dimidiam partem tubi fissus : lobi ovati, acuti, 5–6 mm. longi. *Corollae* tubus gracilis, pubescens, cylindricus, 12·5 mm. longus ; lobi patentes obovati, labii inferioris trilobi palatus lateralibus longior. *Stamina* longe exserta ; filamenta gracillima, glabra, antheris oblongis 2 mm. longis, loculis parallelis. *Ovarium* rotundatum, obtusum, stylo gracillimo, stigmate brevissime bilobo. *Drupa* non visa.

Malay Peninsula. Kedah ; at Terutan, Lankawi Island, *Curtis*, 3789.

472. Clerodendron umbratile, *King et Gamble* [Verbenaceae] ; species *C. penduliflora*, Wall., affinis, foliis latioribus et calycis lobis ovatis cuspidatis distincta.

Arbuscula vel arbor parva, ramulis teretibus fulvis fistulosis. *Folia* membranacea, opposita, integra, plerumque oblonga, obovata

vel oblanceolata, apice abrupte longeque acuminata, basi rotundata vel aliquanto attenuata, utrinque glabra, 20–40 cm. longa, 5–15 c.m. lata ; nervi utrinque 8–12, graciles, par infimum a basi rectum, reliquia curvata in nervulum intramarginalem sinuatum desinentia, nervulis transversis irregularibus ; petioli 2·5–7·5 cm. longi, flaccidi. *Paniculae* ex axillis superioribus elongatae, laxae, paullo curvatae, glabrae, 10–15 cm. longae ; pedunculi graciles, 10–18 cm. longi ; rami divaricati, recti, cymulis pauciflоris ; rhachis complanata, paullo alata ; bracteae foliosae, lanceolatae, ad 2–5 cm. longae ; bracteolae multae, lineari-setaceae ; pedicelli graciles, puberuli, 2·5–12·5 mm. longi. *Calyx* albus vel viridescens, fructu ruber, glaber vel paullo puberulus, fere ad basin fissus, lobis ovato-acuminatis cuspidatis 15 mm. longis, in fructu accrescentibus. *Corolla* alba, rubro-tincta : tubus gracilis, cylindricus, 10–15 mm. longus ; lobi spathulati, apice rotundati, tubo aequilongi. *Stamina* exserta, filamentis glabris, antherarum loculis parallelis. *Ovarium* rotundatum, obtusum, stylo gracillimo, stigmatis lobis 2 brevibus. *Drupa* nigra, carnosa, globosa, 12·5 mm. diametro, pyrenis 4 vel paucioribus. *Semina* rotundata, 6 mm. diametro, cotyledonibus carnosis.

Malay Peninsula and Archipelago. Perak; at Kapayong Kinta, *Wray*, 167 ; in dense jungle 1,000–1,100 m., *King's Collector*, 722, 6959, 8268 ; *Scortechini*, 2198 ; *Derry*, 3704, 10,712 ; *Curtis*, 3116 ; at Bujong Malacca, *Ridley*, 9700. Sumatra ; in the Lampongs, *Forbes*, 1333, 1565.

473. **Clerodendron Ridleyi**, *King et Gamble* [Verbenaceae]; species distinctissima subgeneris Siphonanthi, multis notis a *C. Siphonantho*, Br. differt, praecipue foliis oppositis ellipticis vel ovatis, panicula brevi pauciflora, et drupa rubra nec caerulea.

Arbor parva, gracilis, ad 5 m. alta; ramuli quadrangulares, lucidi. *Folia* opposita, membranacea, integra, elliptica, elliptico-lanceolata vel ovata, apice caudato-acuminata, basi rotundata vel cuneata, utrinque glabra, subtus etiam pallida, 7·5–18 cm. longa, 2·5–7·5 cm. lata, nervi paria 5–7, par infimum ex basi oblique ascendens, alia magis patentia, omnia in nervulum intra marginalem sinuatum congruentia, nervulis transversis paucis et reticulatione haud manifesta : petioli gracili, 2–5 cm. longi, lineis decurrentibus alati. *Panicula* terminalis, pauciflora, cum pedunculo vix ad 15 cm. longa et 7·5 cm. lata ; rami divaricati ; bracteae foliosae, lanceolatae, acuminatae, caducae ; bracteolae lineares ; pedicelli graciles, 6 mm. longi ; alabastra longissima, apice clavata. *Flores* albi vel pallide lutei. *Calyx* erectus, profunde fissus ; lobi glabri, lanceolati, caudati, 12–18 mm. longi, saepe glandulis paucis peltatis muniti : calyx fructifer auctus, ruber, 3–4 cm. longus, drupam amplectens. *Corollae tubus* cylindricus, apice paullo infundibularis, 7–9 cm. longus, gracillimus ; lobi obovati, obtusi, 12–13 mm. longi, subaequales. *Stamina* longe exserta, antherarum loculis parallelis. *Ovarium* glabrum, obtusum, 4-lobatum ; stylo longissimo gracilis, stigmatis ramis brevissimis. *Drupa* purpureo-nigra, levis, globosa, carnosa, 12–13 mm. diametro, pyrenis 4–1 pyriformibus striatis. *Semina* drupa conformia, testa membranacea, cotyledonibus crassis carnosis.

Malay Peninsula. Perak; in dense forest near Larut up to 100 m., *King's Collector*, 2944, 3988. Selangor; at Batu Tiga, *Ridley*, 11,862.

474. **Vitex peralata**, *King* [Verbenaceae]; species *V. pteropodae*, Miq., proxima sed foliolis latioribus ellipticis vel elliptico-oblongis, nec scabroso-punctatis, differt.

Arbor patula, ad 24 m. alta et 60 cm. trunci diametro; ramuli crassissimi, angulares, striati. *Folia* coriacea, integra, 5–7-foliolata; foliolorum par infimum aliis multo minus; foliola elliptica vel elliptico-obovata, apice acuta, basi longe attenuata, utrinque glabra, marginibus recurva; foliolum terminale majus, 15–25 cm. longum, 7·5–15 cm. latum, cetera gradatim minora; nervi utrinque 10–14, subtus prominentes, marginem versus curvati, reticulatione conspicue connexi; petioli 7·5–15 cm. longi, utrinque latissime alati, alis ad 5 cm. latis sicut folia nervosis; petioluli nulli vel vix 6 mm. longi. *Paniculae* terminales vel aliquanto axillares, ad 60 cm. longae et 30 cm. diametro; rhachis angularis, sulcata; pedunculi primarii crassissimi, ad 20 cm. longi, paullo complanati, secundarii ramis 4 verticillati; cymulae breves, oppositae vel alternae, multiflorae, ad 13 cm. longae; bracteae lineari-lanceolatae, persistentes, 2·5–5 mm. longae; pedicelli nulli vel brevissimi. *Flores* pallide caerulei, brunneo-striati. *Calyx* roseus, brevissime urceolatus, fulvo-pubescens, 2·5–3·5 mm. longus, lobis brevibus acutis, fructifer paullo auctus et recurvus. *Corollae* tubus campanulatus, 6 mm. longus, extra pubescens, intus villosus; labium superum bilobatum, lobis ovatis acutis 2·5 mm. longis reflexis; inferum trilobatum, lobis puberulis palato longiore lato obtuso, lateralibus oblongis reflexis. *Stamina* exserta; filamenta basi complanata, villosa; antherarum loculis brevibus ellipsoideis. *Ovarium* rotundatum, depressum, supra villosum, infra glabrum, stylo gracili, stigmate bilobo. *Drupa* ovoideo-conoidea, laevis, sulcata, 3–4 cm. longa, 2–3 cm. lata, pericarpio crasso, pyreno conico. *Semen* unicum, testa membranacea, cotyledonibus planis orbicularibus. *King* MSS. in Herb. Calc.

Malay Peninsula. Perak; at Simpang, *Wray*, 2029, 2254, 2305; in dense jungle on low wet ground near Larút, *King's Collector*, 2064, 6187, 6874, 8299.

475. **Vitex longisepala**, *King et Gamble* [Verbenaceae]; species calycis lobis et bracteis conspicuis insignis, ad *V. vestitam*, Wall. accedit sed foliis majoribus et calyce et bracteis differt.

Arbor parva vel mediocris, ramulis crassiusculis obscure quadrangularibus, molliter fulvis sicut etiam inflorescentia et innovationes. *Folia* membranacea, integra, trifoliolata; foliolum terminale majus, basi cuneatum, petiolulatum, lateralibus basi inaequalibus subsessilibus, omnia ovata vel elliptico-ovata, apice abrupte caudato-acuminata, supra sparse hispida et glanduloso-punctata, infra fulvo-pubescentia, ad nervos villosa et glandulosa, 10–30 cm. longa, 5–15 cm. lata; nervi utrinque 8–15, infra prominentes, marginem versus curvati et nervulis transversis multis connexi; petioli 5–15 cm. longi, dense fulvo-pubescentes. *Cymae* oppositae, axillares, 2–5–6 cm. longae, pedunculis vulgo 2 verticalibus 2–4 cm. longis ramis dichotomis patentibus corymbosis; bracteae conspicuae, anguste

lanceolatae, 6–20 mm. longae, persistentes; pedicelli 2–3 mm. longi. *Flores* flavi primulini. *Calyx* villosus, campanulatus, tubus 2·5 mm. longus; lobi 5 subaequales, oblongo-lanceolati, 6–6·5 mm. longi, conspicui. *Corollae* tubus gracilis, infundibularis, 10–13 mm. longus, extra glandulis luteis instructus; intus ad staminum insertionem villosus; labium superum breviter bilobum, lobis rotundis; inferum 3-lobum, palato obovato lobis lateralibus duplo longiore. *Stamina* exserta, filamentis gracilibus glabris, antherarum loculis elongatis. *Ovarium* conoideum, dense flavo-glandulosum, stylo gracili, stigmate bifido. *Drupa* ovoidea, rugosa, laevis, glanduloso-punctata, 7–8 mm. longa; pyrena dura, reticulata, sulcata, infra cava, supra loculis 4 fertilibus. *Semina* obovoidea, paullo complanata, 2 mm. longa.

Malay Peninsula. Penang; at Batu Kawan, *Curtis*, 275. Perak; at Bujong Malacca, *Ridley*, 9723; at Tapa, *Wray*, 1319; at Waterloo, *Curtis*; in open jungle, Goping, *King's Collector*, 460; *Scortechini*, 100, 113, 340. Selangor, *Ridley*, 7595; at Rawang, *Goodenough*, 10488.

476. **Petraeovitex Scortechinii**, *King et Gamble* [Verbenaceae]; species distincta, a *P. Riedelii*, Oliv., foliis 3-foliolatis, nec pinnatis, differt.

Frutex fortasse scandens, ramulis fulvis angulosis puberulis. *Folia* opposita, membranacea, trifoliolata, petiolo 4–5 cm. longo; foliolum medium ovatum, apice breviter et obtuse acutum, basi rotundatum vel cuneatum, 5–8 cm. longum, 2·5–5 cm. latum, utrinque pubescens, marginibus integris vel undulatis, nervis utrinque 4, petiolulo 12–19 mm. longo; foliola lateralia similia sed minora, basi cordata, paullo inaequalia, petiolulis 6 mm. longis. *Cymae* in paniculas axillares 2- vel 3-chotomas fulvas ad 15 cm. longas dispositae; bracteae foliosae, orbiculares, 13–19 mm. longae, pallidae; pedicelli breves. *Calyx* profunde fissus, fulvo-pubescens, lobis 5 vel 4 oblongis vel spathulatis 6 mm. longis: fructifer valde accrescens; tubus 6 mm. longus, fructum includens; lobi 19–25 mm. longi, scariosi, elliptico - oblongi, 3–5 - nervi, reticulati. *Corolla* alabastro brevissima, lobis spathulatis. *Stamina* 4, exserta, 2 posteriora longiora, filamentis brevibus; antherarum posticarum loculis parallelis, anteriorum divaricatis. *Ovarium* cylindricum, villosum, apice obtusum, loculis 2, stylo brevi et stigmate lobis 2 patentibus. *Fructus* capsularis, oblongus vel cuneatus, ad 6 mm. longus, exocarpio chartaceo striato. *Semina* 2–1, ad placentam centralem affixa; testa membranacea; cotyledones obovatae, carnosae 3–4 mm. longae, radicula crassa.

Malay Peninsula. Perak, *Scortechini*, 753 (vel 1753 ?).

477. **Petraeovitex bambusetorum** *King et Gamble* [Verbenaceae]; a *P. Scortechinii*, King & Gamble, foliis saepe 1-foliolatis glabratis et capsula non striata differt.

Frutex scandens, ramulis fulvis teretibus. *Folia* opposita, chartacea, 1- vel 3-foliolata, glabra, integra, petiolis 2·5–5 cm. longis; foliola ovata, reticulata, apice acuminata, basi rotundata vel paullo cuneata, 7–10 cm. longa, 4–6 cm. lata; nervi utrinque 8, curvati,

in nervulum intramarginalem desinentes; petioluli 6–12 mm. longi, mediano longiore. *Cymae* in paniculas axillares thyrsoideas glabratas ad 12 cm. longas et 7·5 cm. latas dispositae; rhachis angularis, gracillima; bracteae foliosae, lanceolatae, longe acuminatae; bracteolae minutae, setaceae; pedicelli breves. *Calyx* in alabastro vix 1 mm. longus, lobis acutis triangularibus; fructifer magnopere auctus, tubo conspicue striato 6–9 mm. longo, lobis oblongo-spathulatis membranaceis trinervis reticulatis 10–13 mm. longis. *Corolla* parva, bilabiata; labium superum breviter bilobum, inferum profunde trilobum, lobis omnibus minimis glabris. *Stamina* 4, subaequalia, filamentis crassis, antherarum loculis oblongis parallelis. *Ovarium* rotundatum, stylo brevi, stigmate bilobo. *Fructus* capsularis, cuneatus, 7–8 mm. longus, exocarpio tenui pubescenti non striato. *Semina* 2–1, ad placentam centralem affixa, testa membranacea; cotyledones obovatae, truncatae, paullo emarginatae, carnosae, radicula crassa.

Malay Peninsula and Islands. Perak; in dense bamboo forest at 160–200 m. near Ulu Kerling, *King's Collector* 8765. Borneo; *Haviland*, 1913; *Ridley* 9065.

478. **Congea Forbesii**, *King et Gamble* [Verbenaceae]; *C. vestitae*, Griff., et *C. tomentosae*, Roxb., affinis sed ab utraque specie inflorescentia et foliis distincta et praecipue bracteolis 2 intra bracteas involucrales insignis.

Frutex magnus supra arbores alte scandens, ramulis gracilibus cano-pubescentibus. *Folia* chartacea, oblonga vel oblongo-lanceolata, apice breviter acuminata, basi rotundata vel cordata, supra praeter nervos glabra, lucida, infra molliter pubescentia, ferruginea, 7–13 cm. longa, 2·5–4 cm. lata; nervi utrinque 5–6, marginem versus curvati, nervulis pluribus transversis reticulatis conspicuis; petioli 5 mm. longi, fulvo-pubescentes. *Paniculae* terminales, fulvo-pubescentes, racemosae, ad 30 cm. longae et 15 cm. latae; ramuli plerumque 2, pedunculis gracilibus 2·5–4 cm. longis; capitulae geminatae, 2–5 cm. distantes; bracteae foliosae, coloratae; bracteae involucrales 4, cano-tomentosae, oblongo-spathulatae, 2·5–4 cm. longae; bracteolae 2, lineari-setaceae, 7–8 mm. longae. *Flores* pallide purpurei. *Calyx* tubuloso-infundibularis, utrinque, praecipue intus, dense villosus, 7–8 mm. longus; lobi triangulares, acuti, 2 mm. longi. *Corollae* tubus cylindricus, gracilis, 7–8 mm. longus, extus glaber, intus ad faucem annulatus, villosus; limbus bilabiatus, labio supero lobis 2, infero lobis 3, lobis omnibus margine crenulatis. *Ovarium* obovoideum, apice parce glanduloso-punctatum, stylo gracillimo. *Drupa* obovoidea, sicca, exocarpio laevi crustaceo. *Semen* unicum; testa tenuissima; cotyledones inaequales, carnosae, apice depressae, radicula minima.

Malay Islands. Sumatra: in deep forest in Lampongs, *Forbes*, 1567.

479. **Acrymia**, *Prain* [Labiatae-Ajugoideae]; genus novum ovario et fructu omnino *Ajugoidearum*, florum configuratione *Ajugae* Linn., sed eorum magnitudine dispositioneque *Cymariae*, Benth., accedens; habitu *Gomphostemmatis*, Wall., *Prasiearum*.

Calyx campanulatus, sub-10-nervis, aequaliter 5-dentatus, fructifer parum urceolato-globosus, fauce intus nuda. *Corollae* tubus breviter exsertus, ad faucem parum ampliatus; limbus 2-labiatus, labio postico suberecto 2-fido distincto, antico patente lobis lateralibus posticis subaequalibus, intermedio latiore integro. *Stamina* 4, didynama, anticis longioribus distincte exsertis; antherae 1-loculares. *Discus* parvus, aequalis. *Ovarium* ad medium 4-lobum; stylus apice 2-fidus, lobo postico perbrevi. *Nuculae* obovoideae, reticulato-rugosae, areola laterali fere ad medium extensa affixae.—*Suffrutex* nanus, foliis majusculis. Verticillastri laxi, cymis pedunculatis floribundis, omnes axillares. Flores parvi, numerosi.

Acrymia ajugiflora, *Prain*; species unica.

Suffrutex nanus. *Caulis* basi lignosus, ibique prostratus, radicans, 5–8 cm. longus, 5 mm. crassus, parce fulvo-tomentosus, apice internodiis brevibus vel brevissimis densius foliosus. *Folia* opposita, petiolata, elliptica, apice obtusa, basi cuneata, nonnunquam inaequaliter, vel raro sub-truncata, margine basi integra excepta crenata, supra intense subtus pallidiore viridia, utrinque praesertim secus nervos 5–7-jugos et venas reticulatas fulvo-strigosa; lamina 12–20 cm. longa, 5–8·5 cm. lata; petioli 2–5 cm. longi, dense fulvo-strigosi. *Flores* parvi, cymosi, cymis axillaribus; pedunculi strigosi, graciles, 4–5 cm. longi, dichotome ramosi; pedicelli gracillimi, strigosi, 2–3 mm. longi, bracteolis subulatis longiores. *Calyx* campanulatus, 5-dentatus, 2·5 mm. longus, fructifer urceolato-globosus, 3·5 mm. longus, nervis strigosis. *Corolla* alba, 8 mm. longa, tubo sursum ampliato 4·5 mm. longo; labium posticum 2-lobum, 2·5 mm. longum, lobis oblongis obtusis; anticum 3-lobum, 5 mm. longum, patens, lobis lateralibus posticis similibus iisque vix minoribus, intermedio obovato integro 4 mm. longo 3·5 mm. lato. *Stamina* 4, didynama anticis longioribus, exserta; filamenta ima basi hirsuta, ceterum glabra; antherae 1-loculares. *Nuculae* obovoideae, 1 mm. longae, reticulato-rugosae, praesertim versus apicem parce hirsutae, demum glabrescentes.

MALAYA. Perak; in chalky hills, 150–250 m., flowering in August, *Kunstler*, 10709.

The plant on which this genus is based is closely allied to *Cymaria*, Benth., the hitherto known species of which also seem to be restricted to limestone rocks. While, however, *Acrymia* agrees with *Cymaria* as regards its peculiar inflorescence and repeats the characters of calyx and fruit met with in that genus, it differs from *Cymaria* in having a 2-lobed upper lip which does not conceal the anthers. In *Cymaria* the upper lip is oblong, entire and vaulted over the stamens whose anthers are distinctly 2-celled. Except in being much smaller the corolla of *Acrymia* resembles rather closely the corolla of *Ajuga*, a genus in which the anther-cells, though usually discrete, are sometimes ultimately confluent. In *Acrymia*, however, the anthers appear to be 1-celled from a very early stage. The habit of *Acrymia* recalls that met with in the group of species belonging to the genus *Gomphostemma*, which includes *G. ovatum*, Wall., and *G. Mastersii*, Benth., and is unlike that met with either in *Cymaria* or in *Ajuga*.

480. **Pogostemon (Paniculata) nepetoides,** *Stapf* [Labiatae-Satureineae]; species *P. plectranthoidi* quam maxime affinis, bracteis tamen minoribus foliisque margine crenatis satis differt.

Suffrutex erectus, ramosus ·75–1 m. altus. *Caules* ramique robustiores, obscure 4-goni, appresse fulvo-pubescentes. *Folia* ramisque opposita, decussata, herbacea, late ovata, obtusa vel subacuta, basi truncata vel rotundata vel breve lateque cuneata, margine basi integro excepto duplicato-crenata, supra praesertim secus nervos sparse appresse pubescentia, subtus praesertim secus nervos densius appresse fulvo-pubescentia, 4–7 cm. longa, 3·5–5·5 cm. lata; petioli 1–2·5 cm. longi, dense appresseque fulvo-pubescentes. *Verticillastri* in spicis simplicibus continuis ovato-cylindricis pedunculatis 2 cm. longis 1·25 cm. latis aggregati, pedunculis pubescentibus ·5–1 cm longis; spicae dense ad apices ramorum paniculatae; bracteae latae, ovatae, striatae, acutae, apice coloratae, inferiores 8 mm. longae, floribus vix aequilongae, ceterae sursum gradatim breviores. *Calyx* anguste campanulatus, 5·5 mm. longus, extra pubescens, lobis 5 lato-lanceolatis acutis aequalibus tubo duplo brevioribus. *Corolla* pallide purpurea, 8 mm. longa, extus parce pubescens, lobis subaequalibus. *Filamenta* sub-adscendentia, barbata. *Styli* rami subaequales, 3 mm. longi. *Nuculae* ovoideae, glabrae.

PHILIPPINES. Without precise locality, *Micholitz*.

XVIII.—THE LOCALITIES OF CUMING'S PHILIPPINE PLANTS.

R. A. ROLFE.

An unfortunate confusion exists in Herbaria as to the localities of the plants collected by the late Hugh Cuming in the Philippines and other places visited during the same voyage, which has led to various plants being wrongly credited to the Philippines, and in at least one case has resulted in the imposition of an erroneous specific name.* Some of these errors have already been pointed out,† but others are still being cited in Monographs,‡ and as some additional information has been discovered in the correspondence of the late Sir William Hooker it seems desirable to outline the history of the collection.

During the dispersal of his earlier Natural History Collections, made in South America and the Pacific Islands, Cuming had had much correspondence with Dr. (later Sir) William Hooker, then

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* *Henslovia philippinensis*, A. DC., based on Cuming, n. 2255, is a native of Malacca.

† Rolfe in Journ. Linn. Soc. xxi. p. 287; Vidal Phanerogamae Cumingianae Philippinarum, pp. 85-88.

‡ *Eriocaulon truncatum*, Ham., is given as Philippine on the strength of Cuming, n. 2326 (Ruhl. in Engl. Pflanzenreich, Eriocaul. p. 107), but the specimen was collected in Malacca. Miss Perkins also cites Cuming 2330 (*Mangifera lagenifera* Griff.) as Philippine (Fragm. Fl. Philipp. p. 25), but it also came from Malacca.

at Glasgow, and in a letter from 79, Charlotte Street, Fitzroy Square, London, dated November 24, 1834, Cuming remarked :— "I shall feel most obliged if you will gain any information in Glasgow or Greenock respecting Manilla and the Philippine Islands, as it respects the climate, state of society amongst the lower classes and the aborigines, or any information of the Civil Government towards strangers, particularly those who might visit this place on Scientific pursuits. At the same time please to let me know if there have been any collectors of Natural History in those Islands, or Botanists. I am still of a roving mind, and should I gain anything like a satisfactory account of the place I have a great mind to pay it a visit for two or three years."

On July 6, 1835, he again wrote, announcing that he had received the permission of the Spanish Court from the Spanish Ambassador, through the influence of the Earl of Derby, to visit the Philippine Islands. He also announced his intention to start early in the New Year, and to collect the most complete Flora that circumstances permitted, including fruits and woods, and at the same time requested hints and instructions as to collecting, and letters of introduction to persons who might have interests in the Straits of Malacca, Singapore, Penang, Canton, Java and Manilla, which places he hoped to visit. Various other letters followed, showing that Dr. Hooker heartily assisted the project. Finally on December 18, 1835, Cuming announced his intention to sail from Liverpool on or about the 15th of January following.

On December 24, 1836, Cuming announced that he had arrived at Manilla on July 24th, but as the rainy season had just set in he could not make excursions into the country until the end of September. He then left for the Hacienda of Calaguan (Calauan), in the Centre of Luzon (Province of Laguna), where he remained till the 15th of December, making excursions in the neighbourhood, the result being that he had already collected about 1,150 species of all classes, of which about a tenth were ferns. He had also about 60 Orchids (not many in flower) and 125 Fungi. He was then preparing for a journey to the southern islands, Cebu, Negros, Leyte and Mindanao, where he expected to give an equally good account of himself.

On November 18, 1838, he again wrote, alluding to a letter sent a year previously, to which no reply had been received, so that it probably failed to reach its destination. He now reported as to his further journeys. After leaving Calaguan (Calauan) he went to the islands of Panay, Guimaras, Negros, Siquijor, Cebu, Bohol, Camiguin and Mindanao, which occupied ten months, and at the close the plants amounted to 1,900, including many ferns. His last trip was a continuation of the journey to the southern islands, namely, Samar, Leyte, Mashate, Ticao, Burias, Mindoro, and the south-eastern provinces of Luzon, Albay, Camarines, Tayabas and Batangas. His fern collection was now augmented to 400 species, and the plants to 3,000. He had ascended to the very tops of some of the mountains, to 5,000, 6,000 and even 7,000 feet. On the sea coast the plants were the same in all localities, but the dark woods and deep glens were his delight. He was now preparing for a journey to the north part of the island, and he expected to return in July following. In October he would start for Singapore,

which he would leave in March, 1840, en route for England. He had received much assistance and protection from the Government and the authorities, and the friars were his best friends. But he had suffered much from ill health and fatigue, and his eyes had been injured by being in the sun too much—in short he was ten years older than he ought to have been. He had had the misfortune to have a large case of plants stolen from the warehouse in which it was deposited. How he should succeed in the north he could not say, as there was war between the Negroes and the White people, but he could not leave such a place untouched.

On June 5th, 1840, writing from 8, King's Road, Gray's Inn, London, he announced his safe arrival that morning from Singapore, with all his collections. Since his last letter he had been at Mt. Ophir, in the Malay Peninsula, and collected, as promised, a splendid fern, with many others, at 4,600 feet elevation. He hoped to have his collections in order by the end of August, and if convenient for Dr. Hooker to be in London he hoped to meet him, "more particularly so," he added, "as it is my wish for you to have the first choice in all the plants, as before." He also added :—"I will exert myself to get all the plants in order ; those families that I am acquainted with I will put together, such as the Ferns, Orchideae, Malvaceae, with their localities, time collected, &c."

On October 13th he wrote, from 80, Gower Street, Bedford Square :—"I have the pleasure to inform you that my labours in unpacking are nearly finished, as I have but one case to put in order, which I expect to be done by the end of the week."

From a letter dated May 25th, 1841 (after Sir William Hooker had moved to Kew), it appears that the plants were distributed by April 15th (the number being 2,571), and were waiting to be dispatched ; also that Mr. Bennett had been present most of the time while the distribution was being made. On November 26th (evidently in response to an application for the localities) he again wrote that Mr. Bennett, "of the Museum," kept a correct record of all the localities, of which he could not get a copy until his return from holiday, but that when the plants were selected the localities were put on the numbered distribution ticket which began a new locality, and this was done to every set. The promised copy was sent on March 9th following, but is unfortunately incomplete, not accounting for the ferns, and specially excluding a lot of things described as "miscellaneous from the Philippines, consisting of the Fungi, Mosses, Lichens, Figs, Lycopodiums, &c., &c." There was apparently another complaint, for on February 22 (the year is omitted) he wrote :—"I am now going over my plants, and hope in a few days to send you the missing localities that you are deficient of. That, with the list I have received from Mr. Bennett, I hope will prove to your satisfaction." Whether the promised information was ever received is uncertain, as no trace of it can be found. Whether Mr. Bennett's original list is still in existence is also doubtful, as no trace of it can be found at the British Musuem. But it probably contains the same imperfections as Sir William Hooker's copy.

The copy in question was evidently utilised in the preparation of an old list of determinations from which the localities given in Vidal's Phanerogamae Cumingianae Philippinarum was largely extracted, but the inclusion of numbers cited from other sources has introduced a number of contradictions, so that great uncertainty exists as to many of the localities.

From the preceding it is clear that Cuming used no field numbers, and that the distribution numbers were not added until after the ferns and other Cryptogams, Orchids, Figs and some others had been separated. These numbers were given as the bundles were successively distributed, and only partially indicate the sequence in which the places were visited. With the information now published it might be possible to eliminate some of the errors by a re-examination of the original tickets, but it is doubtful whether the material for a complete itinerary is in existence. The correspondence shows that some such journal was prepared by Cuming and submitted to Sir William Hooker with a view to publication, but was returned as unsuitable. Its subsequent history cannot be traced.

An attempt has been made, in the light of the above correspondence, and with the aid of Sir William Hooker's original list of determinations, to trace the localities of the extra-Philippine numbers but only with partial success. Among the flowering plants the earliest numbers for Sumatra, Malacca, Singapore and St. Helena have been found, and all are carefully localised by Cuming himself, as described above. This shows that numbers 2252 to 2399 are from Malacca, 2400 to 2427 from Singapore, 2428 to 2443 from Sumatra,* and 2444 to 2464 from St. Helena. Besides these errors there are certain others, arising from the fact already mentioned that certain groups had been separated before the numbers were added. Very few indications of what these are can be found in Sir William Hooker's list. But there are the following respecting the Vascular Cryptogams:—363 to 368, Singapore; 369 to 407, Malacca; 420 to 429, St. Helena. No indications of Sumatran ferns can be found, either here or in Smith's Enumeratio Filicum Philippinarum, which also included Cuming's extra-Philippine numbers. These numbers require confirmation, because 369 and 420 are not localised by Cuming on the ticket, while 363 has not been found. The list also indicates 2443 to 2251 as Sumatran Algae, and 2443 is carefully localised on the ticket by Cuming himself. A few other numbers are localised in pencil, and in a tentative way, on the list, but as the corresponding determinations are not entered it is impossible to verify them, and the only practicable course would be to compile a new list from the original tickets as the missing specimens come to hand.

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* The numbers from Sumatra and St. Helena were not correctly indicated in Vidal's Phanerogamae Cumingianae Philippinarum.

XIX.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: VII.

I. FAUNA.

COLEOPTERA.

H. St. J. Donisthorpe.

The following species of Coleoptera taken in Kew Gardens are mostly new to the published list of the Wild Fauna and Flora of the Royal Botanic Gardens, Kew. The number of species recorded up to now is very small, and there is no doubt that more close and systematic working will produce many more. Specimens taken by Mr. G. Nicholson are marked "G. N." and those taken by myself "H. J. D."

Adephaga.

Amara continna, *Th.*, flying in grounds (11, v., 95). H. J. D.

Amara similata, *Gyll.*, in Propagating Pits (21, xii., 07). G. N.

Pristonychus terricola, *Hbst.*, under stone. Queen's Cottage Grounds (21, xii., 07). G. N.

Hydrophilidae.

Cercyon flavipes, *F.*, on window in Propagating Pits (3, xii., 07). H. J. D.

Cercyon unifunctatus, *L.*, on window in Propagating Pits (3, xii., 07). H. J. D.

Cercyon quisquilius, *L.*, on window in Propagating Pits (3, xii., 07). H. J. D.

Cercyon nigriceps, *Marsh.*, on window in Propagating Pits (3, xii., 07). H. J. D.

Staphylinidae.

Homalota occulta, *Er.*, on window in Palm House (23, iii., 96). H. J. D.

Cilea silphoides *L.*, on window in Propagating Pits (3, xii., 07). H. J. D.

Ocypus morio, *Gr.*, under stone in Fern House (28, i., 08). H. J. D.

Philonthus laminatus, *Crentz.* (12, iv., 06). G. N.

Philonthus varians, *Pk.*, Propagating Pits (3, xii., 07). H. J. D.

Homalium rivulare, *Pk.*, on window in Propagating Pits (3, xii., 07). H. J. D.

CLAVICORNIA.

Choleva nigricans, *Spence*. Queen's Cottage Grounds (21, xii., 07). G. N.

Choleva grandicollis, *Er*. Queen's Cottage Grounds (21, xii., 07). G. N.

LAMELLICORNIA.

Oxyomus porcatus, *F*., on window in Palm House (23, iii., 96). H. J. D.

SERRICORNIA.

Ptilodactyla santivincentis, *Champ*, ♂ ♂ and ♀ ♀. Propagating Pits (3, xii., 07); 4, i., 08, &c.) The ♂ ♂ have beautifully flabellated antennae.

Rhragonycha pallida,, *F*. (12, iv., 06). G. N.

Malachins bipustulatus, *L*. (12, iv., 06). G. N.

Necrobia rufipes, *De G*., in parcel of specimens from Uganda (21, i., 08).

PHYTOPHAGA.

Plectroscelis concinna, *Marsh* (12, iv., 06). G. N.

HETEROMERA.

Meloë prascarabaeus *L*. The common "Oil beetle." In grounds (29, iv., 89). H. J. D. The "Oil beetles" in their early stages are parasitic on bees of the genus *Anthophora*.

RHYNCHOPHORA.

Phyllobius pyri, *L*. (12, iv., 06). G. N.

Phyllobius maculicornis, *Germ*. (12, iv., 06). G. N.

Phyllobius vividiaeris, *Saich*. (12, iv., 06). G. N.

"Scolytid" sp? Propagating Pits (3 & 4, xii., 07). Five specimens were taken of this small Scolytid beetle which I have been unable to name or get named at the Natural History Museum. H. J. D.

HYMENOPTERA.

FORMICIDAE (Ants).

H. St. J. Donisthorpe.

The following is a list of the ants taken by, or obtained for, me in the hot-houses at Kew since December 3rd last. I am indebted to the kindness of Professor Forel for the names of most of the species. In his last letter he writes "you have a large Fauna in the houses at Kew." They are all my own captures except where it is otherwise stated. Those marked with * are new to the Kew published list (Bulletin, Additional Series V., 1906, p. 27).

Prenolepis longicornis, *Latr.* A cosmopolitan species. ♀ ♀ and ☿ ☿ Propagating Pits, and No. 18. J. H. Dines found a nest in a flower-pot in the Propagating Pits containing 13 ♀ ♀.

***Prenolepis caeciliae**, *Forel.* Species from Costa Rica. Abundant in Fern and Palm Houses.

Prenolepis vividula, *Nyl.* Central American species. Occurs in No. 18 and Palm House (23. III. 96). The late Mr. Haliday took it in hot-houses in Ireland.

***Prenolepis flavipes**, *Smith.* Japanese species. ♂ ♂, ♀ ♀, and ☿ ☿ amongst lily bulbs from Tokio. Jan., W. B. Little.

***Plagiolepis alluardi**, *Em.* Species from Seychelles Isles. Abundant in Palm House. Occurs in the Botanic Gardens in Edinburgh and Dublin.

Technomyrmex albipes, *Smith.* Cosmopolitan species. Abundant in Propagating Pits, Fern and Palm Houses, &c. Winged ♂ ♂, and very interesting ergatoid (wingless) ♂ ♂ not uncommon in Palm House.

***Ponera coarctata**, *Latr.* Winged ♀. Palm House.

***Ponera coarctata**, sub. sp. **boerorum** *Forel.* South African species. ☿ ☿. Fern House.

***Tetramorium simillimum**, *Smith.* Cosmopolitan species. ♀ ♀ and ☿ ☿. Palm House.

***Wasmannia auro-punctata**, *Roger.* West Indian species. Abundant in Propagating Pits and No. 18. ♂ ♂, ♀ ♀ and ☿ ☿; nests in and under flower-pots, and in the leaf-sheaves of *Piper obliquum*, var. *eximium*. It is stated to cultivate fungi.

***Pheidole anastasii**, *Em.* var. **cellarum**, *Forel.* Central American species. ☿ ☿, both the small form, and the large form with very big heads, called "soldiers," in numbers. Orchid House, C. P. Raffill. This new variety is very abundant in the hot-houses at Zurich.

Triglyphothrix striatidens, *Em.* Widespread. ☿ ☿ scarce in Fern House and common in Palm House.

***Strumigenys rogeri**, *Em.* West Indian species. ☿ ☿ scarce in Propagating Pits.

HEMIPTERA-HOMOPTERA.

APHIDAE.

R. Newstead.

The only representative of this family sent to me since the publication of the first paper on the Kew Fauna is an interesting species apparently new to the British Isles, and although it was, in the first instance, thought to be new to science, I have come to the conclusion that it is the insect described by Passerini as *Rhizobius menthae*. Buckton[1] says that he has not been able to identify this and an allied species in England, so that the record is of much interest.

The examples have been forwarded to the British Museum of Natural History so that they may be available for future study.

[1] Monograph of British Aphides, vol. iv., p. 93.

I have given a description of the insect, and have also added figures of the antenna, proboscis and anterior tarsus in order to facilitate its identification by those who may be interested in the study of these somewhat obscure insects.

Rhizobius menthae, *Pass.*

Females and developmental stages living in aggregated masses of densely felted or flocculent secretion on the underground stems and roots of the food-plant. The flocculent matter is pure white, but extremely fragile, and is usually formed upon the underground stems and roots, more especially the former, where there are small cavities in the surrounding soil. Isolated sacs sometimes occur, and these are irregularly spheroid in shape.

Apterous adult female dull orange yellow, sometimes with a pale reddish tinge, especially on the dorsum. Legs, antennae and proboscis smoky brown, articulations black. The integument, in life, is covered with a fine thin coating of meal-like secretion, but this does not obscure the colour of the integument. Antenna (Fig. 1) slightly tapering, of five segments ; 1st much the broadest, 3rd, 4th and 5th with irregular rings of minute spines and a few larger spines ; apical segment emarginate, the emargination with a tuberculate process which is partly hidden by a fringe of wavy hairs. Legs (Fig. 2) short stout, sparsely spinose ; first tarsal segment with a longer spine than those on the other segments of the leg. Proboscis (Fig. 3) of four segments, the length equal to that of the anterior leg, but slightly stouter at the base. Compound spinnerets large, compact, much depressed, and arranged in a double irregular series in groups of from 7–11 in number. The derm is also furnished with a few minute spines which are widely separated and irregularly placed.

Rhizobius menthae.

Habitat: On the roots and underground stems of *Mentha aquatica*, The Lake, Kew, 13.10.06. Collected by Mr. G. Nicholson, to whom I am much indebted for a liberal supply of specimens.

The young females and larvae resemble the adults in colour; but the immature females are generally covered with a long white flocculent secretion.

The characters herein described agree, on the whole, with Passerini's description of *Rhizobius menthae*, but I do not find the marked variation in the antennal formula which is said by the author to exist in this insect. It is just possible therefore that the examples from Kew may hereafter prove a distinct species; but we know so little of the structural characters of the British Aphides that I do not deem it desirable to add to the confusion that already exists by erecting a new name for this addition to the fauna of the British Isles.

Coccidae.

R. Newstead.

This second supplementary list of the scale insects includes but a single species (*Pulvinaria vitis*, var. *euonymi*) that is new to the Kew Fauna; but the food-plants of the remaining species are all new. As stated in the previous list these are important from an economic standpoint, and should be placed on record.

Physokermes abietis, *Geoff.* (Females only.)

Two examples were "shaken into an umbrella" from *Calluna vulgaris* (6.6.07); but as this insect is confined to the Spruce fir (*Picea excelsa*) these specimens had in all probability fallen from the branches of an overhanging tree.

Pulvinaria vitis, var. **euonymi**, *Gour.* (Females only.)

On *Euonymus europaeus variegatus* (7.6.06); Coll., W. Dallimore.

Lecanium persicae, var. **ribis**, *Fitch.* (Females only.)

On *Ribes speciosum*, a Californian species growing against a (11.12.07). Coll., W. B. Little.

On *Teucrium radicans* and *Cercis chinensis* (on a wall). Coll., W. B. Little (30.1.08).

Lecanium longulum, *Douglas.* (Females only.)

On *Putranjiva Roxburghii.* Coll., G. Nicholson (28.3.07).

Lecanium oleae, *Bern.* (Females only.)

On *Randia macrantha.* Coll., G. Nicholson (1907).

Pinnaspis buxi, *Bouché.* (Females only.)

On *Vellozia tricophylla.* Coll., G. Nicholson (1907).

Diaspis boisduvallii, *Sign.* (Females and male puparia.)

On *Vellozia tricophylla*, from British Central Africa, House No. 18 (19.9.07). Coll., G. Nicholson.

Aspidiotus zonatus, *Frauen.*

A large colony of male puparia, on the underside of the leaves of *Quercus pedunculata.*

These examples formed the prettiest little colonies that I have yet seen in this country, and they were unusually numerous, though the females were very scarce.

Dactylopius citri, *Risso.* (Living adult females and empty male puparia.)

On *Myrtus communis*, var. *tarentina.* Coll., W. B. Little, (30.1.08). The host plant was growing against a wall, some distance from a glass house. This record is therefore of great interest as showing the hardy nature of this insect. It is, I believe, the common practice among horticulturists of this country to expose bug-infested houses to the action of frost with the view of ridding such structures of meally bug. In the light of this discovery it is quite evident that such measures must be altogether futile.

II. FLORA.

PHANEROGAMS AND VASCULAR CRYPTOGAMS.

A. B. Jackson.

Trifolium pratense, var. **americanum,** *Harz.* Rough grassy and shady places in the Arboretum and elsewhere. It differs chiefly from the common form of the Red Clover in being much more robust in habit, a foot high or more, and having the stems clothed with spreading not appressed pubescence. No doubt of American origin and only found here in a naturalised condition. Harz points out (Bot. Centralb. 45, 106) that large quantities of the seed of this American form are sown in Germany, and I am informed by Messrs. Sutton that it is cultivated to some extent in this country. They state however that, while in special cases it may prove very luxuriant, yet its height and vigour differ with soil and climate, and they have not found it to be any more productive than other strains. It seems, too, to be affected by variations of temperature and on account of this susceptibility is not strongly recommended as a fodder plant.

Scirpus maritimus, *L.* This species, which has been inadvertently omitted from the Kew list, occurs within our area on mud banks by the river associated with *Eleocharis palustris*, *Scirpus triqueter*, *S. carinatus* and other moisture-loving plants. It is rare inland but has been known as a Thames plant for over a century, and is still holding its own here. The figure in Curtis Fl. Londinensis is drawn from a Thames specimen. See Trim. & Dyer, Fl. Middlesex, 299 (1869).

Lolium italicum, *A. Br.*, var. **muticum,** *DC.* Rough unmown places about the Arboretum, especially near the Palace. This awnless variety of the Italian Rye-grass grows here with the type,

and is liable to be passed over for *L. perenne*. It may be distinguished by the scabrid rachis, but is connected with the type by an intermediate state, which has some of the flowering glumes shortly awned. A very variable species; when growing under luxuriant conditions, as it does at Kew, the spikes often become branched.

L. perenne × italicum. A grass which Dr. K. Domin thought was this combination was not uncommon at Kew last August wherever the parents occurred.

Selaginella krausiana, *A. Br.* Occurs in a naturalised condition in the Rhododendron dell and in the Rockery. Is not uncommon naturalised in warm parts of Devon and Cornwall. A native of Cape Colony, Fernando Po, Azores, &c.

MUSCINEAE.

Decranoweisia cirrata, *Lindb.* This common species had not been known to fruit in the gardens until Mr. Nicholson found it in small quantity on the branches of an elder in Queen's Cottage Grounds. In a barren state it has been found in the Arboretum on trunks of oak and elm. This is a frequent species in the Midlands, sometimes covering thatched roofs with its green cushions which bristle with capsules. It is however somewhat erratic in its distribution, and is still unrecorded from Cambridge, Hunts and West Norfolk. It is very rare or extinct in Oxfordshire.

Barbula tophacea, *Mitt.* On blocks of Oolite by the small pond in the Himalayan House or North wing of the Temperate House. Mr. Nicholson tells me the stone was brought from Moreton-in-Marsh, Gloucestershire.

Weisia tenuis, *C. Mueller.* Same habitat as the last and doubtless introduced at the same time.

Splachnobryum Wrightii, *C. Mueller.* In August last Mr. Nicholson found in one of the forcing houses a moss which had somewhat the habit of a *Fissidens*, in good fruit on woody stems of *Vellozia trichophylla*—a tropical African Monocotyledon, sent from British Central Africa by Mr. J. McClounie. Microscopic examination showed that this moss belonged to the genus *Splachnobryum*, which consists entirely of tropical and sub-tropical mosses. Mr. H. N. Dixon, who recently (Journ. Bot., 1907, p. 81) described another species, *S. delicatulum*, found as an alien on brickwork in an orchid house at Baldersby Park, Yorks, on seeing a specimen of the Kew novelty, suggested that it might belong to *S. Wrightii*, C. Mueller, Verhandl. Zool. Bot. Ges. Wien., 1869, p. 501, a West Indian species, which was also detected in the Royal Botanic Gardens, Glasnevin, Dublin, where it was no doubt introduced with stove plants. This was described and figured by Braithwaite (Journ. Bot., 1872, 193). The Kew plant agrees well with drawings of the leaves and areolation of *S. Wrightii*, which Mr. W. R. Sherrin was good enough to make for me from British Museum material, collected by Wright in Cuba. Dr. Brotherus, however, to whom I also sent a specimen, considers it an undescribed moss, pointing out in addition that the habitat was

unique—no species of *Splachnobryum* being known to occur on plant stems. Mr. Dixon after seeing a second specimen and the drawings writes :—

I certainly cannot see anything to separate the *Splachnobryum* from *S. Wrightii*, C. Mueller, judging from the drawings ; and I cannot help thinking it would be a mistake to describe it as new, from the material available unless there were some decidedly marked character to base it upon. It is I suppose possible that it may not be on its original host at present ; the Baldersby plant (see Journ. Bot., 1907, 81) died away each year and re-appeared, presumably from the spores, and if this were the case with the Kew plant it might conceivably have come over with a western plant originally." Dr. Brotherus in a further communication states that he is unable to say whether or not the plant is identical with *S. Wrightii*, as he has not had an opportunity of comparing it with that species.

Eurhynchium piliferum, *Bruch. et Schimp.* On clay in the Rhododendron dell ; a new locality. Previously only known from the Palace Grounds.

XX.—MISCELLANEOUS NOTES.

Sir Richard Strachey, R.E., G.C.S.I., F.R.S.—By the death at his residence in London on February 12, 1908, of this distinguished Anglo-Indian official and statesman, in his 91st year, Kew has lost a warm and devoted friend.

A grandson of Sir Henry Strachey, Bart., of Sutton Court, Somerset, and third son of the late Edward Strachey, Bengal Civil Service, Sir Richard was born at Sutton Court on July 24, 1817. After two years spent at the military college of the Hon. East India Company, Addiscombe, he was appointed to the Bombay Engineers in 1836, and was transferred to the Bengal Engineers in 1839. With the exception of an interval of active military duty during the first Sikh war, when at the battle of Sobraon his horse was shot under him, and of another interval during the Indian Mutiny, when he served as Secretary in all departments to the Central Provinces Government temporarily constituted to meet the occasion created by the investment of the Lieutenant-Governor of the North-West Provinces in Agra, the whole of Sir Richard's services were devoted to the Department of Public Works, at first in connection with irrigation and later in connection with railways. Of his great and lasting achievements as a civil servant, and of his many and signal services to India and its Government, this is not the place to speak ; nor is it necessary here to detail his contributions to, or to describe the results of his active interest in, the subjects of Indian meteorology and Indian geography, as to which he was a recognised authority. A record of his efforts to advance our knowledge of Indian botany may, however, be appropriately given here.

At the close of the Sikh War Strachey, who had made the authoritative plan of the Sikh position and of the attack at Sobraon, and had assisted in the construction of the bridge across

the Sutlej which enabled our troops to enter the territory of the Sikh Khalsa, was given a brevet-majority for his distinguished services, and was permitted to return to the substantive post of Executive Engineer of the Ganges Canal, to which he had been appointed in 1842. Frequent attacks of fever, however, necessitated his transfer to the Hill Station of Naini Tal, and afforded him opportunities, of which he availed himself to the utmost, of studying the vegetation of the North-Western Himalayas, more especially in Kumáon and in the adjacent portions of Garhwál and Tibet.

Little was known regarding the flora of Kumáon until about sixty years ago, when Strachey commenced his scientific survey of the mountain ranges westward of Nepal, and afterwards, in 1848, undertook an extensive journey with Mr. J. E. Winterbottom to the Rakas-tál and Manasarowar Lakes in Tibet. It was on the latter occasion that a large proportion of the plants contained in what is known as the "Strachey and Winterbottom Herbarium" was collected. Starting from the plain of Rohilkhand at an elevation of about a thousand feet above sea-level, a north-easterly route was taken across the snowy ranges, and terminating on the Tibetan plateau at an altitude of between fourteen and fifteen thousand feet on the upper course of the river Sutlej. A detailed account by Sir Richard Strachey of this very interesting journey will be found in the Journal of the Royal Geographical Society of London, Vol. XV. (1900), which is also referred to in a paper by Hemsley on the "Flora of Tibet or High Asia" published in the Journal of the Linnean Society, Vol. XXXV. (1902). The herbarium, which contained over two thousand species (including cryptogams), was distributed in 1852–53 to the Hookerian Herbarium (now at Kew), the British Museum, the Linnean Society, and to some of the Continental museums. All the specimens were carefully labelled with notes of the localities and elevation at which they were found. A provisionally named catalogue, prepared by Sir R. Strachey, was printed, and a copy was sent with each distributed set of plants. This catalogue was afterwards revised, and appeared in 1882 in Atkinson's "Gazetteer of the Himalayan Districts of the North-West Provinces and Oudh" (now known as the United Provinces of Agra and Oudh). At the request of Sir Richard Strachey another revised edition was prepared by Mr. J. F. Duthie, formerly Director of the Botanical Survey of Northern India, and was published in 1906 by Messrs. Lovell Reeve and Co. It contains the whole of the Strachey and Winterbottom collections, with the nomenclature of the species brought up to date in accordance with Sir Joseph Hooker's "Flora of British India." It also includes many additional species discovered subsequently by various collectors.

Of the large number of new species and varieties discovered by Sir R. Strachey, no less than thirty-two bear his name. One of these, *Stracheya tibetica*, representing a distinct and monotypic genus, was found by him in the Gugé Valley, within the borders of Tibet, at an elevation of fifteen thousand feet. But perhaps the most interesting novelty, from a botanical point of view, was a very minute plant called *Circeaster agrestis*, which, owing to the extreme simplicity of its floral structure, has presented much

difficulty in the attempts of botanists to determine its true affinity; and even now it occupies only a provisional and somewhat doubtful position as a member of the natural order *Chloranthaceae*. It was found by Sir R. Strachey in the Rálam Valley at about eight thousand feet above the sea, and has since been collected in Tibet and in North China.

Sion and Pagoda Vistas.—When, in 1845, the Pleasure Grounds of Kew were put under the charge of Sir William Hooker (who had already had charge of the adjoining Botanic Garden since 1841), W. A. Nesfield, a noted landscape gardener of the time, was commissioned to prepare a scheme for the treatment of the newly acquired area, both from a landscape point of view and as a national, scientifically-arranged Arboretum. The most notable and enduring features of Nesfield's scheme were the two noble avenues known as the Sion and Pagoda Vistas.

Although the two great divisions of the "Kew Gardens" of earlier days—the Pleasure Grounds and Botanic Garden—were henceforth under the one management, a light iron fence still divided them, and no attempt beyond the formation of these two vistas (and a shorter one to the west) appears to have been made to blend their landscape treatment. The various plantings on one side of the fence had no bearing or connection with those on the other side.

As a matter of history it may be mentioned that the iron fence just alluded to was erected in 1843. In that year 45 acres had been taken, by permission of Queen Victoria, from the Pleasure Grounds and added to the old Botanic Garden, which at that time covered under 20 acres. The fence marked the new boundary. It began a little to the north of the Unicorn Gate and followed fairly closely the course of the historic "Stafford Walk" until it reached the private grounds of Kew Palace. In that position it remained until April, 1895, when it was removed, and the differentiation of "Kew Gardens" into the Botanic Garden and the Pleasure Grounds no longer obtained.

Since the removal of the fence every opportunity has been taken to blend the two parts of the Gardens, especially by opening up informal vistas and avenues extending from one to the other. These vistas have not only improved the landscape aspect of Kew by giving a sense of greater spaciousness and distance of view, but have also proved useful in providing new routes for visitors, who, previous to 1895, had to find their way from one section of the Gardens to the other by means of one or other of the four gates in the fence. One more step was required to link the two parts of the Garden and to mask the transition from Botanic Gardens to Pleasure Grounds. This, however, involved some modification in the treatment of the two great formal vistas, and, owing to the pressure of other work, it has been necessary till the past winter to allow these to remain unaltered. A gravel walk ran along the centre of each of them from the Palm House to the Stafford Walk. The remainder, extending to the Pagoda in the one case and to the banks of the Thames in the other, has long been smooth lawn.

After the fence was taken away this distinction had no meaning, and the aspect of each vista was impaired by the gravel walk breaking into the long sweep of lawn and abruptly ending. In both cases, too, the avenue of trees stopped at the Stafford Walk. During the past winter the gravel paths have been turfed over as far as the holly hedge that surrounds the formal garden south-west of the Palm House, and the avenues of trees have been extended to the same boundary. Two new gravel walks have been made to replace those turfed over; one leads from the formal garden direct to King William's Temple; the other, also commencing at the formal garden, has been made to join the path which skirts the Azalea Garden and passes through the Beech and Hazel collections to the Bamboo Garden.

W. J. B.

Utilization of Pond Mud.—Several of the old agricultural writers have advocated the utilization of pond mud, and as a writer in "British Husbandry" (1837) observes: "The mud from ponds, when they are cleaned out, has always been an object of attention to farmers." The composition of the sediment may vary considerably, as will be seen from analyses given below, and is naturally dependent on the character of the pond. Where a pond is placed at the lower part of a field it is likely to receive, after rain, surface washings which may be rich in manure. If, however, the pond contains springs, the sediment may be of little or no value.

Pond mud has proved valuable at the Royal Botanic Gardens, Kew, where the deposit from the bottom of the lake has been used for some years past for general gardening purposes, as a dressing for the lawns, and also as a mulch for the beds, borders, and trees. It has also been used for such pot-grown plants as chrysanthemums, dahlias, fuchsias, pelargoniums and other gross feeders. The best examples of *Calanthe* and *Phaius* (orchids) ever grown at Kew were planted in this mud. It is also an excellent soil for vegetables. As an example of how freely it may be used for trees, mention may be made of a mulch, 4 in. thick, which was placed last winter about the large horse-chestnut near the Thames; the effect of this on the health of the tree is already most marked. The only plants for which it has not been found suitable are *Ericaceae* and peat-loving plants generally. Probably this is due to the presence of calcium carbonate in the Thames water, from which the Kew lake is fed, and also to the shells of various molluscs which are abundant in the lake. The only harm that might possibly result from the use of this mud would arise if it were allowed to lie as a cake, so that air was excluded from the roots. The mud at Kew is the silt from the Thames water and contains decomposed vegetable matter from the surrounding trees, &c.; when first taken out it has almost the consistency of clay, and in this condition is unsuitable for use. The practice at Kew is to drain off the water from the lake, and when the mud can be cut out with spades it is carried in barrows on to the banks where it is allowed to lie and drain until it can be broken up easily. It is then distributed over the lawns, woods, beds, &c.,

where under the influence of weather it soon breaks down. If used on beds or borders it is forked over, and mixed with the other soil soon after it has been put on. For lawns it is used in the proportion of about 20 loads to the acre, it is then chain harrowed and raked, and after that it soon works down below the grass. When the lake was first cleaned out in 1892 to 1894 the mud was found to be five feet deep in some parts, and altogether some thousands of loads were removed.

An analysis has been made of the mud taken from the Kew lake, and also of some pond mud from Nottinghamshire. The sample from Kew contained 45·15 per cent. of moisture and that from Nottinghamshire contained 78·81 per cent.; in order to enable them to be compared, the results are given in the following table free of moisture :—

	Sample from Kew.	Sample from Notts.
	Per cent.	Per cent.
Organic matter* and loss on heating ...	11·30	27·71
Oxide of iron and aluminium	8·17	10·45
Lime	12·04	7·79
Magnesia, alkalies, &c.	0·97	7·05
Carbonic acid	8·85	
Phosphoric acid	0·27	0·32
Insoluble siliceous matter	58·40	46·68
Total	100	100
*Containing nitrogen	0·439	0·862
Equal to ammonia	0·533	—

It will be seen that the Kew sample in its dry state had less than half the quantity of vegetable matter (and nitrogen derived therefrom) contained in the other. It had, however, more lime and nearly as much phosphoric acid. The fact that the one sample contained so much less water than the other would make the Kew sample in its natural state the richer of the two. The quantity of lime would make it a useful material for any land where lime is needed.

Two other samples of mud from ponds in Kent are referred to in the fifth report of the Analytical Laboratory at the South-Eastern Agricultural College, Wye. Sample A was from a pond which had not been "mudded" since 1836, and as neither ditches nor drains run into it, the water supply has been kept up only by percolation through the soil which is described as a sandy clay. For many years the pond had, throughout the summer, been a mass of weeds, mainly silk weed and *Nymphaea alba*. The analysis showed this mud to contain 23·3 per cent. of water, 7·8 per cent. of organic matter, and ·183 per cent. of nitrogen.

Sample B was from an adjacent pond into which a little ditch and several drains run. It was expected that the mud would be very rich and it was used as a dressing for hops. Analysis showed, however, that the mud was little, if any, richer than the soil of the hop garden, and it had not, therefore, much value as a fertiliser.

It is mentioned in the report that "The fermentation processes going on at the bottom of a pond are very complete, organic matter is broken up into carbonic acid, marsh gas and hydrogen, and free nitrogen is probably liberated also. Resistant forms of organic matter would survive, but these have little value as manure." The analysis showed this sample to contain 52·2 per cent. of water, 7·3 per cent. of organic matter, and ·175 per cent. of nitrogen.

Generally speaking, the effect of such material is as much a physical or mechanical one as a chemical one, and if used on land of a lighter and drier texture would help in improving it. On heavy land, on the other hand, it might not be so successful. It should do very well as a top-dressing for grass.

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Various Presentations.—GARDENS.—Kew is indebted to the Honourable Walter Rothschild, F.L.S., of Tring Park, Tring, for a valuable donation of orchids, including a number of species not previously represented in the national collection. The donor has been an enthusiastic collector and grower of orchids for many years, and his interest was extended to species of purely botanical importance as well as to those possessed of attractions of a popular character. Consequently the Tring collection was reputed for the number of rarities it contained, and as the proprietor was known to dealers and collectors as a generous purchaser of new and rare orchids, Tring became a kind of emporium for them. Such genera as *Bulbophyllum*, *Cirrhopetalum*, *Megaclinium*, *Catasetum*, *Masdevallia*, *Cryptophoranthus*, *Pleurothallis*, *Angraecum*, were represented by numerous species. Among those presented to Kew are the following :—*Bulbophyllum Binnendijkii*, *B. Ericssoni*, *B. Reinwardtii*, *B. virescens*, *B. parvimentatum*, *Cirrhopetalum Rothschildianum*, *C. biflorum*, *Ancistrochilus Rothschildianus*, *Angraecum Rothschildianum*, *Lissochilus giganteus*, *L. Horsfalliae*, *Eulophiella Peetersiana*, *Mormodes badium*, *Masdevallia sororcula*, and *M. deorsa*. In addition to orchids various other plants were presented, including large masses of several species of *Doryanthes*, specially imported from Queensland, and some interesting aroids.

MUSEUMS.—Leaf, spadices and fruits of a species of *Hyphaene* from Surat, together with photographs of this tree, and of *H. thebaica*, grown at Baroda. Received from Mr. G. H. Krumbiegel, Superintendent, State Gardens, Baroda. Case 56, Museum No. II.

Acacia mollissima. Wood and bark specimens, from Mr. J. Medley Wood, A.L.S., Director, Botanic Gardens, Durban, Natal. Case 45, Museum No. I.

Dorema Ammoniacum. A sample of the gum-resin, purchased in a drug store at Biskra, Algeria. Received from Dr. Schweinfurth, per Dr. Stapf.

Series of photographs of the Karroo region, S. Africa, from Prof. M. C. Potter, Armstrong College, Newcastle.

Odontadenia speciosa. Small sample of rubber prepared from this plant, present value about 2*s.* per lb. Received from Mr. J. H. Hart, F.L.S., Superintendent, Royal Botanic Gardens, Trinidad. Case 78, Museum No. I.

Specimens from Gold Coast. Rubber from *Funtumia elastica*, coagulated with an infusion of the leaves of *Bauhinia reticulata*. Case 78, Museum No. I.

Fruits of *Landolphia senegalensis*. Case 75, Museum No. I. Fruits of *Elaeis guineensis*, var. The pericarp of the fruit yields a white oil. Case 61, Museum No. II. Received from Mr. A. E. Evans, Botanical and Agricnltural Department, Gold Coast.

Mangrove (*Rhizophora Mangle*). Young plants and an aerial branched root 52 feet in length. Received from Mr. W. Crosley, Prestea, Gold Coast. Case 51, Museum No. I. and Museum No. III.

Produce from Mincing Lane. *Hevea brasiliensis*, oil from the seeds, from Ceylon. Chillies from Java. False Buchu (*Barosma pulchella* ?) from Cape Colony. *Scopolia japonica*, roots from Japan.

JODRELL LABORATORY.—A portrait of Dr. D. H. Scott, F.R.S., whose retirement from the post of Honorary Keeper of the Laboratory was recorded in the *Kew Bulletin* for 1906, p. 383, having been subscribed for by botanists who have from time to time actually worked in the Laboratory, was on the afternoon of Saturday, 29th February, presented to Kew by the subscribers. It is placed in the Keeper's private room. The portrait is the work of Mr. J. Kerr-Lawson.

LIBRARY.—The Bentham Trustees have presented to the Library an excellent copy of the *Buch der Natur* of Conrad von Alemann, of Magdeburg, usually known as Conrad von Megenberg. It is a small folio of 240 leaves, including two blank, and 12 full-page woodcuts. Title-page, pagination, signatures and catch-words are all wanting, as is usually the case in books of the period to which it belongs. The full-page consists of 35 lines in one column, printed in Gothic type. The volume is dated 1482, and was published at the press of Anthonius Sorg, in Augsburg. Many of the leaves are quite uncut, and the binding of the original boards covered with stamped leather is remarkably well preserved. The *Buch der Natur* was first printed in 1475, and altogether six editions appeared in the fifteenth century, the last in 1499. According to Meyer (*Geschichte der Botanik*, iv. 198–206, 278–280) other editions with a slightly modified title were issued in 1536 and 1540, and Pritzel (*Thes. Lit. Bot.*, ed. 2, n. 6052) records an edition, edited by F. Pfeiffer, and published at Stuttgart, in 1861. From evidence which the book itself affords we gather that Alemann flourished about the middle of the fourteenth century. He himself was not the author of the work, for he acknowledges that he translated it from Latin into German. Meyer supports the opinion of Choulant that it is a very free translation of *De naturis rerum*, an unpublished manuscript of

Thomas Cantipratanus, and the results of the comparison he has made of the portions concerning plants in both works leave little doubt in the matter as to the accuracy of this view. The *Buch der Natur* is divided into 12 chapters, of which 9 and 10, comprising 55 leaves, deal with trees, shrubs and herbs. The recto of two of these leaves bears woodcuts of plants, which, though very rude, are in several instances sufficiently true to nature to admit of their identification. Amongst the herbs delineated are *Convallaria majalis*, *Ranunculus acris*, *Centaurea Cyanus* and *Viola odorata*. It is of interest to draw attention to the fact that the *Buch der Natur* is the first printed book which contains figures of plants, apart from those which appear in landscapes and arabesques in other works. The distinction of being the first book printed in Germany with figures of plants has been claimed for the extremely rare *Herbarius*, which was printed at Mainz in 1484, and of which a fine copy, presented by the Bentham Trustees in 1900, is in the Kew Library. The first edition of the *Buch der Natur* as shown above antedates the *Herbarius* by 9 years.

The Bentham Trustees have also presented two copies of *The Trees of Great Britain and Ireland*, by H. J. Elwes, F.R.S., and A. Henry, of which three volumes have so far been issued. This sumptuous work, which will include a full account of all the trees indigenous or cultivated in Great Britain and Ireland, is dedicated to the King and is provided with a preface by Sir William T. Thiselton-Dyer. It will consist of six quarto volumes, each accompanied by about sixty plates in collotype. To the botanist, forester and gardener it is a work of the utmost importance.

Sir Frank Crisp, J.P., has presented a copy of the latest edition (1907) of *La Flore de la Suisse et ses origines*, by H. Christ, translated into French by E. Tièche. It is a re-issue of the 1883 edition with a supplement of 107 pages which consists of a summary of the geo-botanical observations concerning Switzerland made during the last quarter of a century. Through the kindness of the same gentleman the Library has received a copy of *Die Hieracien der Schweiz*, by K. H. Zahn, published in 1906. It is a quarto volume of 563 pages, forming part of the *Neue Denkschriften der allgemeinen schweizerischen Gesellschaft*, Bd. xl.

Defective Oak Spoke.—Messrs. Vickers, Sons and Maxim sent a defective oak spoke to Kew in January last; their letter, together with Mr. Boodle's report, seem to be of sufficient interest for publication.

Extract from letter of Messrs. Vickers, Sons and Maxim to the Director of Kew.

We are sending you to-day by one of the carriers an Oak Spoke which has been prepared for a Gun Carriage Wheel. You will observe that the timber is full of what appears to be small buds, and we have never seen anything like it before in oak. We buy the billets of wood from timber merchants in sections of about

$4'' \times 3\frac{1}{2}'' \times 30''$ long, and each billet is carefully inspected when cleft before it is accepted on our behalf, but the buds, which are such a striking feature of the spoke sent you, were either not visible on the cleft surface, or they may have been covered over, which seems unlikely, by annular rings without buds. Each billet is carefully stamped with the place of origin and the date, but unfortunately these data were cut off the spoke in question before the peculiar characteristics were noted. We know that it is English grown, but as we buy from Somerset to Kent, we are unable to locate this particular specimen nearer than that. I should be glad to hear from you what is the cause of this peculiarity. If you think that the spoke is of any value to you to put in your show case, you are at liberty to keep it.

Report on Defective Oak Spoke.

The small "eyes" in the wood are abnormally broad medullary rays, many of which have split (presumably in drying). In some cases the broad medullary ray encloses a small ring of woody tissue, which surrounds a second medullary ray. The appearance of the wood may be compared with the "bird's-eye" structure found in stems on which there are "burrs," but in this instance it appears probable, from the structure, that a large conspicuous burr may not have been present.

The exact cause cannot be ascertained, but the most probable explanation of the structure is that the enlargement of the medullary rays was connected with the formation of adventitious roots in the bark many years before the tree was felled, the roots remaining quite small, or dying after a short time (v. Borthwick, "Adventitious roots and their relation to bird's-eye formation in the wood of various Trees," *Notes from the Royal Botanic Garden, Edinburgh*, No. XVI., Sept., 1905). Each root would be connected with a broad medullary ray, which would be continued radially in the new wood year after year, causing twisted grain in the adjacent wood. Possibly there may have been adventitious buds instead of roots. It is almost certain that the broad medullary rays must have been present at any rate on one surface of the billet, but in unplaned wood they might be inconspicuous, especially if the splits in them have become more pronounced during storage.

L. A. B.

Plants from Labrador.—In continuation of the contributions to the Flora of Labrador by Sir William MacGregor, G.C.M.G., Governor of Newfoundland, published in the *Kew Bulletin*, 1907, pp. 76–88. a further collection of plants has been received at Kew from Sir William MacGregor, through the Colonial Office.

The collection was made at the instance of the Governor, by the Rev. P. Hettasch, in the neighbourhood of Hopedale, on the coast of Labrador.

List of the plants collected by the Rev. P. Hettasch in Labrador, arranged according to Macoun's list of Labrador plants.

Anemone parviflora, *Michx.*
Ranunculus Cymbalaria, *Pursh.*
„ nivalis, *L.*
„ hyperboreus, *Rottb.*
Coptis trifolia, *Salisb.*
Papaver nudicaule, *L.*
Draba incana, *L.*,
var. arabisans, *Wats.*
Arabis alpina, *L.*
Draba fladnizensis, *Wulf.*
Cochlearia officinalis, *L.*
Lesquerella arctica, *S. Wats.*
Viola labradorica, *Schrank.*
Silene acaulis, *L.*
Lychnis apetala, *L.*
„ alpina, *L.*
Arenaria groenlandica, *Spreng.*
„ peploides, *L.*
Stellaria longipes, *Goldie*,
var. Edwardsii, *Britton.*
Stellaria *cf.* S. longipes, *Goldie.*
Cerastium alpinum, *L.*
Astragalus alpinus, *L.*
Oxytropis campestris, *L.*
Lathyrus maritimus, *Bigel.*
Rubus Chamaemorus, L.
„ arcticus, *L.*
Dryas integrifolia, *Vahl.*
Sibbaldia procumbens, *L.*
Potentilla norvegica, *L.*,
var. glabra.
Potentilla norvegica, *L.*,
var. hirsuta.
Potentilla maculata, *Poir.*
„ tridentata, *Soland.*
„ anserina, *L.*,
var. groenlandica, *Tratt.*
Potentilla litoralis, *Rydb.*
Amelanchier oligocarpa, *Roem.*
Saxifraga oppositifolia, *L.*
„ Aizoon, *Jacq.*
„ caespitosa, *L.*
„ cernua, *L.*
„ nivalis, *L.*
Parnassia palustris, *L.*
Sedum roseum, *L.*
Chamaenerium latifolium, *Sweet.*
Viburnum pauciflorum, *Pylaie.*
Linnaea borealis, *Gronov.*
Lonicera coerulea, *L.*
Solidago multiradiata, *Ait.*
Aster puniceus, *L.*
Aster sp. near A. nemoralis, *L.*
Erigeron uniflorus, *L.*
Gnaphalium norvegicum, *Gunner.*
„ supinum, *L.*
Artemisia borealis, *Pall.*
Achillea Millefolium, *Linn.*
Arnica alpina, *Murr.*
Senecio aureus, *L.* var.
„ Pseudo-Arnica, *Less.*
Taraxacum ceratophorum, *DC.*
Campanula rotundifolia, *L.*
Vaccinium uliginosum, *L.*
„ caespitosum, *Michx.*
„ Vitis-Idaea, *L.*
Arctostaphylos alpina, *Spr.*
Cassandra calyculata, *D. Don.*
Andromeda polifolia, *L.*
Loiseleuria procumbens, *Desv.*
Phyllodoce taxifolia, *Salisb.*
Kalmia glauca, *Ait.*
Ledum palustre, *L.*
„ latifolium, *Ait.*
Azalea lapponica, *Wahlenb.*
Pyrola minor, *L.*

Pyrola rotundifolia, *L.*
Moneses uniflora, *A. Gray.*
Diapensia lapponica, *Linn.*
Armeria labradorica, *Wallr.*
Primula farinosa, *L.*
„ misstassinica, *Michx.*
Gentiana sp.
Pleurogyne rotata, *Griseb.*
Menyanthes trifoliata, *L.*
Mertensia maritima, *S. F. Gray.*
Veronica alpina, *L.*
Pedicularis groenlandica, *Retz.*
„ lapponica, *L.*
„ euphrasioides, *DC.*
„ flammea, L.
Rhinanthus Crista-Galli, *L.*
Pinguicula villosa, *L.*
„ vulgaris, *L.*
Plantago borealis, *Lange.*
Polygonum viviparum, *L.*
Oxyria digyna, *Hill.*
Rumex Acetosella, *L.*
Comandra livida, *Richards.*
Alnus viridis, *DC.* (var. ?)
Salix argyrocarpa, *Anders.*
„ vestita, *Pursh.*
„ sp. near S. Uva-ursi, *Pursh.*
„ sp.
Empetrum nigrum, *L.*
Listera cordata, *R. Br.*
Spiranthes Romanzoffiana, *Cham.*
Habenaria hyperborea, *R. Br.*
„ obtusata, *Pursh.*
Streptopus amplexifolius, *DC.*
Maianthemum bifolium, *DC.*
Tofieldia palustris, *Huds.*
Luzula campestris, *DC.*
Eriophorum vaginatum, *L.*
„ Scheuchzeri, *Hoppe.*
„ angustifolium, *Roth.*
Carex capillaris, *L.*
„ rariflora, *Smith.*
„ sp. near C. vaginata, *Tausch.*
Hierochloa alpina, *R. & S.*
„ borealis, *R. & S.*
Equisetum arvense, *Linn.*
Woodsia glabella, *R. Br.*

Sterculia Alexandri.—Specimens of *Sterculia Alexandri*, Harv., including female flowers and fruit, which were hitherto undescribed, have been received from Dr. S. Schönland, Director of the Albany Museum, Grahamstown.

S. Alexandri is known only from the neighbourhood of Uitenhage, Cape Colony, where it was originally discovered in January, 1848, by Dr. R. C. Alexander Prior, "in a ravine above Klein Place." Dr. Prior collected both male and female flowers, but the latter were not seen by Harvey, who described the species in 1859 from Prior's material.*

About the year 1868, *S. Alexandri* was rediscovered† by Mr. G. W. Browning, Collector of Customs at Port Elizabeth, "in a gorge of the Van Staden's River 1–2 miles to the north of where the main road to Capetown crosses the river," and distributed in MacOwan's Plantae Austro-Africanae, No. 2058; and further material was gathered later at the same locality by Mrs. Holland and communicated to Kew in 1881 by Mr. H. Bolus.

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* Proc. Dubl. Univ. Zool. & Bot. Assoc., vol. i., p. 140, t. 15.

† The following particulars are from a manuscript note by Bolus in the Kew Herbarium.

Dr. Schönland writes as follows, in a letter dated January 24th, 1908:—"A few weeks ago it was my good fortune to be guided by a nephew of mine, Master Norman Chase, to a locality where one of our most interesting plants grows, namely, *Sterculia Alexandri*, Harv. It grows on a farm, Kamahas, about six miles north of Uitenhage, in very steep ravines. We went there to collect the fruit, and not only got nearly ripe fruit, but also the female flowers, and as both of these seem to have been unknown hitherto I have pleasure in sending you by the same post specimens of both. We found that the fruits were not quite ripe, but as the baboons, which are plentiful, were evidently eating them rapidly, we thought it best to collect whatever we could, and not trust to the chance of finding ripe fruit later on, especially as it seems that the tree can be easily propagated by cuttings, and I am going to see what can be done in that respect.

"As the baboons were so fond of the seed, I thought I would try them for myself, and I found them to be extremely tasty. They were of a particularly agreeable nutty flavour, and . . . it seems likely that, provided the culture does not present any special difficulties, we have in this tree a plant which is well worth cultivating. I am sure that if grown in gardens it would also make a very handsome tree. In its natural state it is never more than about 20 feet in height, but the foliage is very pleasing."

The closely allied *S. Murex*, Hemsl., which is a native of the Transvaal, has seeds the size of a large grape, which are much esteemed by the natives as an article of food, and are sometimes eaten by white people. The kernel is quite like a sweet chestnut in appearance and flavour. Pigs are very fond of the seeds, and quickly get fat on them. It has been suggested that *S. Murex* is worth a trial by farmers in the lower districts of the Transvaal in any waste and rocky place where it might be difficult to get other species to grow, as the seeds would be a good substitute in pig-feeding for acorns, which cannot easily be grown in the warmer, drier parts of the country (see *Transvaal Agric. Journ.*, vol iv., p. 805).

S. Alexandri belongs to the small series *Digitatae*, K. Schum.,* which includes the following species, all of which have digitate leaves:—*S. Murex*, *S. Pexa* (Cochinchina), *S. versicolor* (Burma), *S. mexicana* (Mexico), and *S. foetida*, which occurs in India, the Malay Archipelago, and Australia.

The following description of the female flowers and fruits of *S. Alexandri* has been drawn up from the material communicated by Dr. Schönland.:—

Sterculia Alexandri, Harv. in Proc. Dubl. Univ. Zool. & Bot. Assoc., vol. i. (1859), p. 140, t. 15; Thes. Cap. vol. i., p. 3, t. 3; Fl. Cap. vol. i., p. 178; descriptio supplementaria (auct. *T. A. Sprague*).

Arbor usque ad 6 m. alta (teste *Schönland*). *Pedicelli* usque ad 1·5 cm longi. *Flores* ♀ :—*Calyx* luteus, intra tubum rubro-variegatus; tubus 8 mm. altus, apice 1·5 cm. diametro; lobi ovato-

* Engl. & Prantl., Nat. Pflanz., vol. iii., part vi., p. 96.

oblongi, 1 cm. longi, basi 7–9 mm. lati, reflexi. *Gynophorum* 8 mm. longum, pilis simplicibus puberulum. *Filamenta* 11–13, in cupulam vix 1 mm. altam extra puberulam connata, superne 0·25–0·75 mm. libera ; antherae vix 1·5 mm. longae. *Folliculi* compresso-ellipsoidei, supra applanati, circiter 8 cm. longi, 5 cm. lati, 4 cm. crassi, apice obtuse umbonati, umbone usque ad 1 cm. longo, tuberculis conicis acutis usque ad 5 mm. longis muricati, pilis stellatis brunneo-tomentelli. *Semina* 4–8 pro folliculo, late ellipsoidea, compressione angulata, ultra 2 cm. longa. *Testa* e stratis quatuor constans, quorum externum crustaceum, secundum corneum, tertium et internum carnosa. *Endospermium* alte bipartitum segmentis plano-convexis embryonem occultantibus. *Cotyledones* foliaceae, ellipticae, circiter 1·5 cm. longae, 1·2 cm. latae, radicula leviter exserta 3 mm. longa.

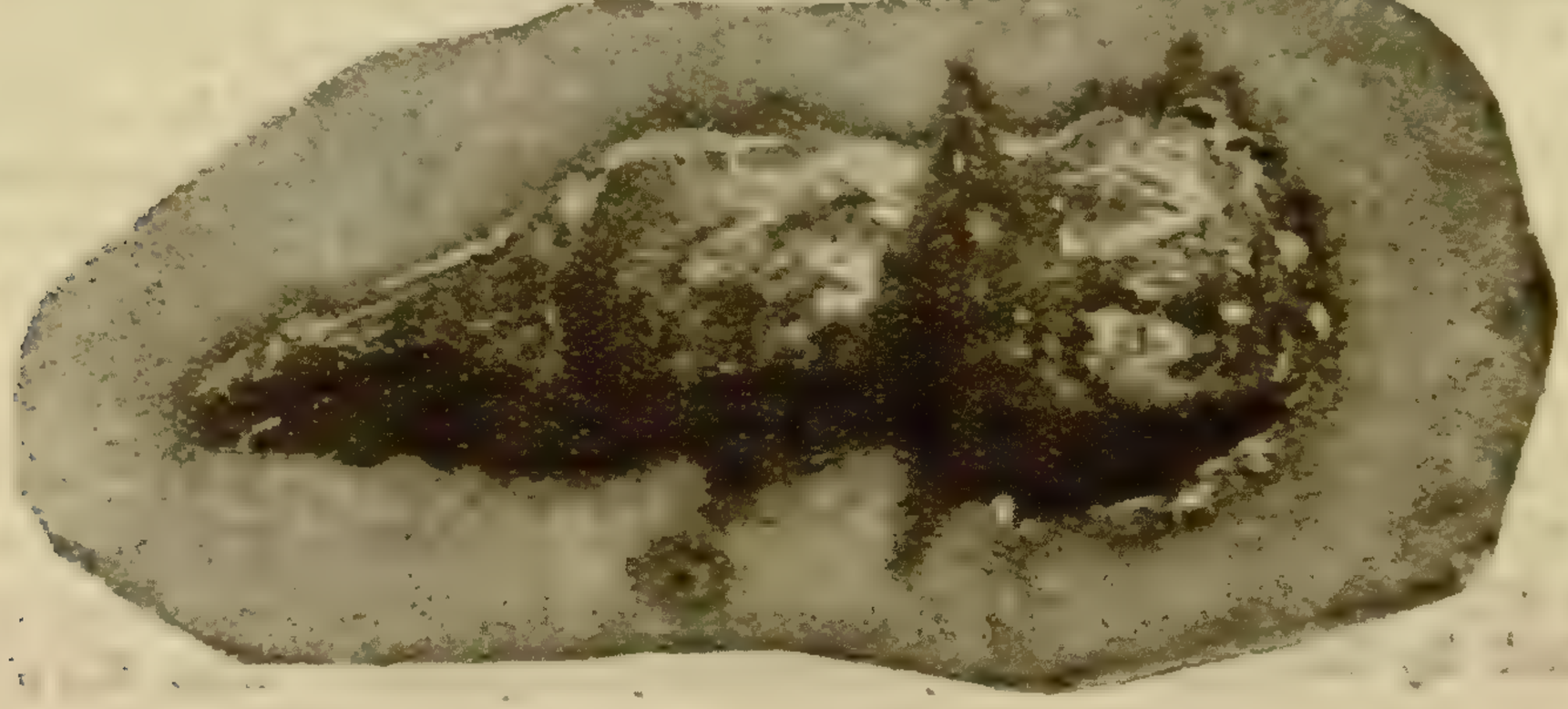
The "female" flowers of *S. Alexandri* have well-developed anthers containing an abundance of pollen, and it is possible that they are really hermaphrodite. T. A. S.

Hollow Potatoes.—During the past autumn some diseased potatoes were submitted to Kew for investigation. The potatoes were well grown and externally showed no trace of injury or disease, but when cut open were found to be hollow, an external shell, varying from a quarter to half an inch in thickness, remaining intact.

In some examples the cavity was quite empty, dry, and lined with a shrivelled mass, suggesting the previous presence of some semifluid substance that had contracted and dried up. In other cases the cavity was more or less filled with a glairy, unpleasant smelling pulp, which on microscopic examination was found to be teeming with nematodes or eelworms.

A series of sections revealed the fact that the nematodes effected an entrance into the tuber through the original point of attachment to its branch. Having once gained an entrance the nematodes gradually used up the substance of the tuber, working from the centre outwards until their progress was checked by the vascular zone which lies at some distance within the periphery.

This zone appeared in every instance to have acted as a perfect barrier to the further extension of the eelworms, hence the tissue lying between the vascular ring and the periphery of the tuber remained uninjured.



Section of Hollow Potato.

The nematode appeared to be *Aphelenchus pyri*, Bastian, a species originally found in decaying pears. Its presence in potato tubers, notwithstanding the amount of injury effected, does not necessarily prove the nematode to be a true parasite ; it is at most a wound-parasite, gaining an entrance into the tuber through the minute opening formed by the decay of the tissue enclosed by the vascular ring at the point of its entrance into the tuber.

Two tubers infected at the point indicated above, by covering the scar with slime containing eelworms obtained from a diseased tuber, were placed under a bell-jar, and kept in the dark at an average temperature of 65° F. After ten days one of the tubers was cut open and revealed a cavity about one inch in diameter fllled with slime containing myriads of eelworms. The second tuber was allowed to remain for a month when the internal cavity was found to have reached the limit of its extension, that is up to the vascular ring.

In a second experiment the "eyes" of two tubers were covered with nematode-bearing slime, and afterwards placed under conditions similar to those described in the previous experiment. After remaining for a month the nematodes had not effected an entry into the tuber, although in some instances small "sprouts" had pushed from the "eyes" through the slime. This experiment may be taken to prove that the nematodes cannot effect an entry through an unwounded surface, even when the tissue is quite young.

No trace of bacteria or fungi was found in the slime.

The potatoes were purchased at the Brentford market, hence their source of origin is unknown, as is also the nature of the soil in which they were grown, or the kind of manure used, &c. Judging from the large percentage of hollow tubers present in the small quantity purchased, it would appear that a local epidemic, caused by nematodes, had existed where the potatoes were grown.

The above account is not intended to convey the impression that all hollow potatoes are due to eelworms. Potatoes are often more or less completely hollowed out by centipedes, more especially by *Julus pulchellus*. In such instances however an entrance is effected by commencing at the surface and eating their way into the interior of the tuber.

G. M.

Botanical Magazine for February.—The plants figured are: *Rehmannia angulata*, Hemsl., *Codonopsis convolvulacea*, Kurz, *Pyrus Tschonoskii*, Maxim., *Potentilla concolor*, Rolfe, and *Larix Griffithii*, Hook. f. The *Rehmannia* is a handsome large-flowered Scrophulariaceous plant from Central China, introduced into cultivation a few years ago by Messrs. James Veitch & Sons. It is not quite hardy, and though probably a perennial it is most satisfactory as a garden plant when treated as a biennial. *Codonopsis convolvulacea* is a native of Eastern Asia, as indeed are all the other species of the genus, of which twenty-two are now known. This species belongs to the small section characterised by having the calyx entirely superior. The Kew plant

was presented by Mr. Max Leichtlin of Baden-Baden. Its flowers are large, broadly campanulate, and blue, with lobes ¾–1½ inches long. *Pyrus Tschonoskii* is a Japanese species, apparently rare in its native country, whence it was introduced into the Arnold Arboretum by Professor Sargent, who, in 1897, presented plants to Kew. It is peculiar on account of its erect open and rather formal habit. The Chinese *Potentilla concolor* is a new species based on *P. Griffithii*, var. *concolor*, Franch. It resembles *P. Russelliana*, a hybrid between *P. argyrophylla*, Wall., var. *atrosanguinea*, Hook. f., and *P. nepalensis*, Hook., which is figured at t. 3470, but its flowers instead of being blood-red are bright yellow. Its appearance in our gardens is due to Messrs. Bees of Ness, Neston, Cheshire, who received it from Yunnan. *Larix Griffithii* is a native of Sikkim and Bhutan. Owing to the great difficulty attending its cultivation it is still very rare in the gardens of Great Britain. The drawing was prepared from material obtained from plants at Kew, supplemented by male catkins furnished by some thriving specimens in Sir Edmund Loder's garden at Leonardslee, Horsham, Sussex.

Yeheb.—The Rev. Dr. Warre, whose interest in this subject has been recorded at p. 37 of this volume, forwards an interesting memorandum by Mr. G. G. Gilligan, an officer resident in British Somaliland, which throws some light on the doubtful points referred to in the concluding paragraph of the previous notice at p. 44. It will be seen that this memorandum, which is reproduced below, gives a third alternative spelling for the native name.

"Yehab.—Grows in the sandy soil peculiar to 'Haud.' Also found in Marehan. Grows in large quantities in good seasons. In 'Haud' found in tract of country amongst which the following places may be named :—Gerlogubi, Galadi, Galkayu, Damot. Nut ready to eat in June. Tree found on the plain (so-called, often very undulating ground). Nuts commence to appear on the bush when about 4–5 feet high; often grows into a large tree still bearing nuts. Extensively used as an article of food. They are stewed or boiled and then eaten—very nourishing and fattening—also cooked in other ways. Water in which the nuts are boiled becomes sweetened, and sometimes Somalis are fond of drinking it. Regular and plentiful rains at certain seasons of the year in the locality where Yehab grows."

The concluding remark is interesting and important in connection with the prospects of successful cultivation of Yeheb beyond the limits of Somaliland. A further note by Mr. Gilligan as to the nature of the subsoil and the range of temperature in the area in which the plant occurs is hoped for.

Adelaide Botanic Gardens.—Fifty years ago last October the Botanic Gardens at Adelaide were thrown open to the public, and the occurrence of the jubilee of this event has been made the occasion of publishing an official illustrated souvenir of the

Gardens. From this account the following brief history has been compiled. In 1854 a sum of £3,000 was voted by the Government as a first instalment for the creation of a Botanic Garden, and in 1855 Mr. Francis was appointed Secretary of the Committee and Superintendent of the Garden. Further sums of money were voted in succeeding years, and a superintendent's house, greenhouse and conservatory were built. In 1859 the first catalogue of the Garden was issued, and in the following year, owing to the growing importance of the Garden, Mr. Francis's title was altered to Director and Secretary. Collections of native plants were made about this time, and one of these, by Mr. Waterhouse, from Kangaroo Island, was of considerable value.

In 1865 Mr. Francis died and Dr. Schomburgk was appointed Director. In the following year an experimental garden and a series of Natural Order beds were laid out.

In 1868 the Victoria Regia house was erected. The plant was the first to be grown in Australia and appears to have flourished remarkably well, for "it produced in the course of six months no less than fifty-four leaves, the largest of which was 6 ft. 4 in. in diameter, and forty-one flowers nearly 13 in. in diameter. The growth of the plant was so vigorous that, notwithstanding the size of the tank in which it grew, 36 ft. by 26 ft., it became necessary to cut away two or three leaves every week in order to make room for the young ones as they came."

In 1870 the second catalogue of the Garden showed upwards of 6,000 species.

In 1874 an addition of 83 acres of land was made to the Garden for the purpose of being converted into a park and some 3,000 trees were planted; and in the same year the Palm house was built.

In 1877 a new Museum was built, and the catalogue of the Garden issued in this year showed 8,500 species in cultivation.

From 1877 to 1891 there is little of general interest to record. In 1891 Dr. Schomburgk died, having been Director of the Garden for 25 years; he was succeeded by Dr. M. Holtze, the present Director. In 1895 the old Exhibition ground came under the administration of the Garden, and in 1897 a typical orchard was started on this ground, but was transferred in the following year to Mount Lofty Ranges, near Mylor, 16 miles from Adelaide.

The Garden has suffered considerably by numerous reductions in its grant, a total reduction of £1,150 per annum having been made between 1890 and 1902. But in 1905 this state of affairs was somewhat remedied by an increase of £400 on the grant for the Garden and Park, which was maintained in 1906 and has since been increased.

St. Lucia Botanic Station.—The following brief history is taken from "Reports on the Botanic Station, Agricultural School and Experimental Plots, St. Lucia," 1906–07, issued by the Imperial Department of Agriculture for the West Indies.

"The Botanic Station was established subsequent to a tour of the West Indies by Mr. (now Sir) Daniel Morris in 1886 in connexion with a scheme for establishing Botanic Stations in the smaller islands with the view of encouraging a diversified system of cultural industries.

"In April, 1886, the people of St. Lucia addressed a memorial to the Secretary of State showing that since the settlement of the island the inhabitants had devoted themselves to the cultivation of sugar-cane almost exclusively; that causes had lately come into operation which tended to reduce the price of sugar below its cost of production; that the people of St. Lucia were eager to take up other economic crops, the cultivation of which offered reasonable prospect of profit; and that it was their firm conviction that other means of existence should be brought within reach of the people in order to lay the foundation of a more solid future prosperity.

"In October, 1886, the late Mr. John Gray, of Jamaica [formerly Head Gardener to the Right Honourable the Earl of Brownlow], was appointed Curator to undertake the work of establishing a Botanic Station. This was begun in February, 1887, on a site to the north of the Protestant Church, finally selected after an inspection of several others by the Curator and an advisory Committee appointed by the Administrator. The greater portion of the site selected was a swamp, across which it was almost impossible to pass from the Darling Road to the 'Chausses,' and which contained many years' accumulations of refuse. Lying as it did to windward of the town, it constituted a serious menance to the public health of Castries.

"Sir Daniel Morris, who had continued to take a deep interest in the foundation of a garden at Castries, visited and reported upon it in December, 1890.

"The work of reclaiming and draining the swamp and laying out and planting the grounds was gradually and successfully carried on for several years by Mr. Gray, but his health was seriously affected by the insanitary condition of the locality in which he laboured, and, after repeated attacks of illness, he died in January, 1895.

"In July, 1895, Mr. J. C. Moore, then in the employ of the Royal Gardens, Kew, was appointed Curator of the station. The reclamation of the remaining portion of the swamp in the northern part of the station was completed in 1897, and the work of draining, laying out walks and lawns, and ornamenting this part of the grounds with suitable plants was completed in 1904. It was not, however, until after the establishment of the Imperial Department of Agriculture under Sir Daniel Morris, in 1898, that many much needed improvements in the station, including water supply, fencing, buildings, better nursery accommodation, permanent labels for the plant collection, etc., etc., became possible.

"The area of the station is about 7½ acres, and although comparatively small, contains an interesting collection of plants, and is a very popular place of resort for visitors and residents. It has also done, and continues to do, good work in rendering assistance to the planting community by raising economic plants and distributing them, with information as to their cultivation.

"In 1899, Mr. G. S. Hudson was appointed to fill the post of Agricultural Instructor, whose duties were to supervise the Department's experiment work in the country districts, and to make periodical tours of the island for the purpose of encouraging and advising the planters and small proprietors on agricultural matters.

"In June, 1901, Mr. E. Buckmire, formerly an apprentice at the Botanic Station, Grenada, was appointed foreman of the station. Later in the same year, the Curator was instructed to reside at, and take charge of, the Agricultural school which was opened in October, 1901, on the Union estate about four miles from the Botanic Station, and acquired by the Government for the purpose. Subsequently, owing to the scope of the Curator's duties having considerably extended in connexion with the expansion of the work of the Imperial Department of Agriculture in the island, his title was changed to that of Agricultural Superintendent.

"In conclusion, it may be stated that the Botanic Station at Castries not only affords a place of pleasant resort for the inhabitants of Castries and visitors to the island, but it forms a valuable educational agent in showing how gardens and plants may be cultivated, and also serves as a centre for the distribution of large quantities of economic plants, such as cacao, limes, and rubber, to start new industries. In addition, it has served to get rid of an unwholesome swamp that was prejudicial to the general health of the residents in the town of Castries."

Fairy Rings.—An interesting article on the Fairy-ring fungus in Australia (*Lycoperdon polymorphum*, Vitt.), and the means of its eradication appeared in the *Agricultural Gazette* of New South Wales for August, 1907, p. 707, and the article has been reproduced in the *Journal of the Board of Agriculture* for December, 1907 (vol. xiv. p. 537). It is possible that the treatment there described may be efficacious in the eradication of 'fairy rings' on lawns in this country, and it would be of interest to learn whether any experiments have been made.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4.] [1908.

XXI.—NOTES ON SOME TRANSVAAL TREES AND SHRUBS.

JOSEPH BURTT-DAVY.

Since the publication of my preliminary account of the native trees of the Transvaal, in the *Transvaal Agricultural Journal* (Vol. V., No. 18, January, 1907), I have been able to compare some of my material with types and authentically named specimens in the Kew herbarium. I wish to express my thanks to the Director and to the members of the Kew staff for their courtesy and assistance in many ways, and especially for their valuable suggestions as to the possible relationship of specimens of which neither flowers nor fruit were available for identification.

I have also been able to examine some of Warburg's types of *Ficus* and named material of Rehmann's collections at Zurich, through the kindness of Dr. Schinz, and have incorporated my Zurich notes with those from Kew. Where Zurich specimens are cited, the fact is noted.

Through the courtesy of the gentlemen in charge, I was able also to examine some South African material in the herbaria of Boissier and of Delessert, at Geneva.

Finally, when passing through Cape Town, on my return to South Africa, I spent a day with Dr. Bolus verifying citations of specimens in his herbarium, and making a few additional comparisons. I wish to take this opportunity of thanking him for the great assistance he has rendered me on this and other occasions.

As it was necessary to make as many comparisons as possible in the very limited time at my disposal at Kew, it was not feasible to give much attention to the dissection of flowers. Where close critical work was required, as in the case of the *Rubiaceae*, *Ebenaceae*, and *Celastraceae*, I have had to content myself for the present with approximate determinations only, reserving closer study for a more favourable opportunity. As it is uncertain when

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I may again be at Kew, it seems desirable to place on record the data already obtained, as a working basis for further investigations in the field and herbarium. If it is clearly understood that the determinations in the case of these critical families are but approximate, it is not likely that they will prove misleading.

The nomenclature of families and genera here followed, is that of De Dalla Torre and Harms in the *Genera Siphonogamarum*. To avoid confusion between their sequence and that of Bentham and Hooker as followed in the Kew herbarium, I have compromised by arranging the families and genera alphabetically, which though not scientific, has the advantage of simplicity and facility of reference.

Twelve genera and seventy-nine species have been added to the original list, while thirteen specific names have been dropped as being synonyms, or for other reasons. The corrected totals at present stand : 57 families, 144 genera, 335 species. When more is known about them, a number of these species will almost certainly be found not to attain the minimum height of ten feet, here taken as the lower limit of a "tree." This is the case in the genera *Rhus*, *Gymnosporia*, *Plectronia* (and some other *Rubiaceae*), *Royena*, and perhaps occasionally also in *Combretum* and *Acacia*. In working through these genera it was found desirable to deal with all the Transvaal species of the genus, and to place the information so gained on record. Moreover, our knowledge of these genera is so incomplete that we are constantly finding that species which are shrubs in one zone, become trees in another.

While comparing my own material with that at Kew it has seemed desirable to place on record some of the determinations arrived at. But in many cases I have not had sufficient material to furnish duplicates for Kew. It does not always follow therefore, that when my own collections are cited, they are also represented in the Kew Herbarium.

The spelling of place names and of Dutch words has been copied from the original labels of the collections, and though not always correct, it has been thought best not to alter it here, for fear of misinterpreting a record.

I.—GYMNOSPERMAE.

TAXACEAE.

In the revision of the *Taxaceae* in *Das Pflanzenreich*, Pilger places the two forms of the common or Regte Geelhout, which we have been calling *Podocarpus Thunbergii* and var. *falcata*, in two distinct sections of the genus, *i.e.*, *Eu-podocarpus* having a thickened receptacle, and *Stachycarpus*, in which the receptacle shows no apparent development. According to this view Thunberg and Robert Brown were right in considering these to be distinct species, and the names given by Brown should stand, as follows :—

Podocarpus (Eupodocarpus) latifolius, (*Thunb.*) *R. Br.* ; (syn. *P. Thunbergii*, Hook.).—Houtboschberg forests (Patatabosch), *Davy*, 5114 ; Drakensberg forests, Lydenburg District, *Legat*.

Podocarpus (Stachycarpus) falcatus, (*Thunb.*) *R. Br.*; (syn. *P. Thunbergii* var. *falcata*, (Thunb.) Sim.—Drakensberg forests, Lydenburg District, *Legat.*

II.—ANGIOSPERMAE.

LILIACEAE.

Aloe Marlothii, *Berger*; "Kopaarse."—Smits Drift Valley, Haenertsburg, plentiful along the eastern slopes of hot, dry hills, 4,000 ft. alt., Jan. 1906, associated with *Euphorbia Reinhardtii.* This is the arborescent species placed tentatively under the name *Aloe* (*ferox*, Mill.?) in my list. There are good specimens in the garden of the late Sir Thomas Hanbury, F.L.S., at La Mortola.

Dracaena sp.—A slender-stemmed species of *Dracaena*, six to ten feet high, occurs in the "bush" on Modjanjies Mt., in the Zoutpansberg. Specimens suitable for identification have not yet been procured.

MUSACEAE.

Musa ventricosa, *Welw.*—The Wild Banana of the Transvaal has been identified from seeds sent by me to Kew, as belonging to this species. This is a handsome plant, well worthy of cultivation in sub-tropical gardens where *M. Ensete* is now grown; the red midribs contrast beautifully with the bright green foliage. It is remarkable that our only known species of *Musa* should be also indigenous to Angola, when there are two species of the Lower Zambesi basin (*M. livingstoniana*, Kirk, and *M. Buchanani*, Baker) which do not appear to extend so far south. An apparent relationship between our northern flora and that of Angola is noticeable in other families of trees. This relationship appears to be closer than that between the floras of the Northern Transvaal and Nyasaland, but this may be only apparent and due to the fact that so little is yet known about the latter flora, while Welwitsch's extensive collections in Angola make us fairly familiar with the plants of that region.

ANACARDIACEAE.

Harpephyllum caffrum, *Bernh.*; "Kaffir plum."—Barberton, Reimer's Creek, 3,000–3,555 ft., a large tree, common, *Davy*, 5199. My specimens have neither flowers nor fruit, but the foliage exactly matches that of Natal specimens; there is no Transvaal material at Kew, and this appears to be the first record of its occurrence in the Colony.

Protorhus longifolia, (*Bernh.*) *Engl.*—My specimens from the Barberton District agree well with one so named, collected by Dr. Bolus near Delagoa Bay. In both the leaves are mucronate, whereas in other specimens at Kew they are very obtuse.

Rhus acutidens, *Engl.*—Houtbosch, *Rehmann*, 5558 in herb. Zurich.

Rhus coriacea, *Engl.*—A manuscript note by Mr. N. E. Brown on a Kew sheet of *R. burkeana*, Sond., indicates that *R. coriacea*

is synonymous; comparison with the Berlin type is necessary to settle this point. Pretoria, *Rehmann*, 4745; Boschveld, Klippan, *Rehmann*, 5329, both in herb. Zurich.

Rhus (**discolor**, *E. Mey.* ?).—Near Lydenburg Stadt, Dec. 1894, *Wilms*, 250; "Hoggeveld bei Bronkhorstspruit," *Rehmann*, 6575, both in herb. Zurich.

Rhus discolor var. *β* **paucinervis**, *Engl.*—Hoggeveld, Page's Hotel, *Rehmann*, 85 in herb. Zurich.

Rhus divaricata var. *β* **fulvescens**, *Engl.*—Hoggeveld, Trigardsfontein (Near Bethal), *Rehmann*, 6705 in herb. Zurich.

Rhus glaucovirens, *Engl.* in *DC. Monogr. Phanerog.* v. 4, p. 432.—A manuscript note by Mr. N. E. Brown on a Kew sheet of *R. Zeyheri*, Sond., indicates that these are synonymous.

Rhus laevigata, *L.*—Houtboschberg, borders of woods, Patatabosch, *Davy*, 5180.

Rhus lancea, *L.*—Two distinct trees are passing under this name: (1) the common Karee-boom of our south-western districts, which I have distinguished as *R. viminalis*, Vahl.; and (2) a broader-leaved species which I have designated as *R. lancea*, L. Both occur in the same region, but appear to me quite distinct, and I have not found intermediate forms. I have not seen the types, and therefore am not able to state which of the two should be called *R. lancea*; until this point is cleared up it will be best to retain the names adopted in my published list, as follows:—

R. lancea, *L.*—The form with lanceolate leaflets and less drooping habit. Wonderboom farm, near Pretoria, alt. about 4,100 ft., *Davy*, 2281; Waterberg district; Pruizen, near Potgieter, occasional at foot of hills, *Davy*, 5200; Smits Drift Valley, Haenertsburg, *Davy*.

R. viminalis, *Vahl.*—The true Karee-boom, with drooping branchlets and willow-like, linear-lanceolate leaflets. Common, Vaal Kiver, "large timber-tree; Boer name Crie-wood," *Nelson*, 23; Blaauwberg, Zoutpansberg, "Mutoto," "Karee," *F. C. Menne*; Wonderboom farm, near Pretoria, *Davy*, 2280; Warm Baths, Waterberg District, 3,600 ft. alt., *Davy*, 2211; Smits Drift Valley, near Haenertsburg, *Davy*. Most of the Kew material from the Karroo, Orange River Colony, &c., which is referred to *R. lancea*, belongs to this form.

APOCYNACEAE.

Rauwolfia caffra, *Sond.* in *Linnaea* v. 23, p. 77.—Magaliesberg, southern slopes, *Zeyher*, 1183 (type); Magaliesberg, "Fls. Octo. and Nov." *Burke*, 113; ("fruit obcord. with two pyr. or obliqu. ellips. with 1 pyr. (by abort.); sec. nerves up to 30 on each side") note on Burke's sheet Crocodile River, November, *Burke* (young fruit); Barberton, river bank, Avoca, tree 40 ft., fls. Sept.–Oct. 1890, *Galpin*, 1061. Extends northward to Nyasaland and the Congo Free State.

Rauwolfia natalensis, *Sond.*—Natal, common tree 33–40 ft. "bark used as Cinchona" *J. H. Bowker*, in herb. Kew. The leaves of this specimen somewhat resemble those of a small *Anthocleista*; it is possible that the former has been mistaken for the latter which is used as Quinine by the Zoutpansberg natives. A specimen from the Zoutpansberg collected by Mr. C. E. Legat (T. D. A. herb. 129) may be this species, but the material is inadequate; the leaves are longer and broader, and the berries larger, than in any specimen of *R. caffra* at Kew. The foliage of this specimen simulates that of *Adina Galpini*, the "um-Thlomu," or "River Matome," for which it is sometimes mistaken.

ARALIACEAE.

Cussonia Gerrardi, *Seem.* (*See Hook. Icon. Pl.* t. 1454; syn. *Panax Gerrardi*, Harv. *Gen.* ed. 2, p. 147).—*Rehmann*, 6485, from the Houtbosch may be this, but the Kew specimen is incomplete.

Cussonia natalensis, *Sond.*—My specimens from Potgieter, Waterberg District, and Smits Drift Valley, Zoutpansberg District, agree well with Natal material at Kew.

Cussonia paniculata, *Eckl. & Zeyh.*—A specimen collected by Burke at "Rhenosterkop near Beaufort," is very like the glaucous-leaved cabbage-wood (species "A" of my list) so common on dry kopjies throughout the Transvaal high veld, but there were no Transvaal specimens at Kew for comparison.

Cussonia spicata, *Thunb.*—Near Lydenburg, *Wilms*, 546. It occurs also in Tropical Africa as a "tree 18 ft. high." Perhaps the species "B" of my list.

Cussonia umbellifera, *Sond.*—Barberton, *Galpin*, 395 "tree 20 to 40 ft."; Houtboschberg forests, common, called "Ma-Tchaytch," *Davy*, 5182.

BURSERACEAE.

Commiphora africana, (*Berg.*) *Engl.*—Kalahari, *Schinz*, in herb. Zurich. This appears to agree with a specimen collected (in leaf and fruit only) near Potgieter, in the Waterberg District, and sometimes found in the hedges planted round Kaffir kraals in the central Zoutpansberg. The bark flakes off as in *Platanus*.

Commiphora (molle, *Engl.?*).—Barberton, dry hillsides, Crocodile-poort, 1,600 ft., Sept. 1890, *Galpin*, 1077, "fls. small, brown." This needs comparison with the type at Berlin.

Commiphora Rehmanni, *Engl.*—Klippan, Bush-veld, *Rehmann*, 5324.

CAPPARIDACEAE.

Maerua angolensis, *DC.* (Oliver in *Fl. Trop. Afr.* v. 1, p. 86).—Smits Drift Valley, Zoutpansberg, granite outcrops, about 4,200 ft. alt., Jan. 10, 1906, *Davy*, 5197; near Potgieter, Waterberg District, *Davy*; Crocodile River Valley, near Barberton, alt. 2,000 ft., Sep. 1890, *Galpin*, 1066, "fls. white"; between Delagoa Bay and

Lebombo Mts., alt. 100 ft., Aug. 1886, *Bolus*, 7642. There are specimens at Kew from the Transvaal; Natal; Zambesia; Abyssinia; Senegal; Nigeria ("small tree 10 ft., stamens pale yellow, calyx green. Often planted on graves." *Barter* in herb. Kew) and the White Nile ("small tree, very brittle wood").

Maerua caffra, (*Burch.*) *Pax*; (syn. *Niebuhria triphylla*, Wendl.).—Lydenburg, "Kloof bei Stephanus Schoeman's farm," *Wilms*, 30; Groenkloof, Pretoria, alt. 4,500 ft., fruiting November, *Davy*, 3206; Aapjies-poort, Pretoria, *Rehmann*, 4237; Crocodile River, *Burke*; Swaziland, Havelock Concession, 3,000 ft., "tree 20 ft." *E. Saltmarshe*, ex herb. Galpin, 1065; Pretoria "in clivis collium 4,200 ft, cir. Tree about 15 ft." *J. H. McLea*, ex herb. Bolus, 5585.

CELASTRACEAE.

The South African genera and species of this family need thorough revision in the light of recent collections.

Catha edulis, *Forsk.*—Mac-a-Mac Falls, 4,300 ft. alt., *Davy*, 5201; Spelonken, "Wild tea," *F. C. Menne*; Spelonken, *H. A. Baily* ("Spelonken tea"); our specimens compare well with Abyssinian specimens from A. de Franqueville, and with Uganda specimens at Kew; the leaves are extremely variable in outline and dentation. Uganda, 5,000–6,000 ft. "small tree; leaves are chewed by natives of British East Africa and Somaliland; said to have great sustaining powers enabling to go without food. I think called 'Yart' by Somalis," *Lord Kesteven*, in herb. Kew.

Elaeodendron aethiopicum, (*Thunb.*) *Oliv.* var. **pubescens**, *Oliv.* in *Fl. Trop. Afr.* v. 1, p. 365; (syn. *Mystroxylon burkeanum*, Sond. in *Fl. Cap.* v. 1, p. 470, teste Oliver, l.c.).—Crocodile River, Nov, *Burke*, 378 (type, in herb. Kew); Pretoria, *Miss Leendertz*, 634; Aapjiespoort, *Rehmann*, 4100.

Elaeodendron confertiflorum, (*Tul.*) var. **leptocarpum**, (*Sond.*) *Szyszyl.*; (syn. *Mystroxylon confertiflorus*, Tul. var. *leptocarpum*, Sond., *Fl. Cap.* v. 1, p. 469.—"Small tree. Fruit edible" *H. Hutton* in herb. Kew; tree 15–20 ft. or much branched shrub, (*Fl. Cap.*); Houtbosch, *Rehmann*, 6459 in herb. Kew and herb. Bolus.

Elaeodendron Rehmanni, *Szyszyl.* — Pretoria, Aapjiespoort, *Rehmann*, 4099 (co-type in herb. Kew). Leaves ovate, very obtuse at base, shallowly dentate.

Gymnosporia acuminata, (*L.*) *Szyszyl.*; (syn. *Celastrus acuminatus*, Linn.).—Swaziland, woods Pigg's Peak, 4000 ft., shrub 8 ft., Mch. 1891, *Galpin*, 1335; Louw's Creek near Barberton, hillside at2,000 ft., alt., April 1890 (fls.); tree 15 ft., *Galpin*, 890, in herb. Kew; some one has marked this sheet "cfr. *Celastrus undatus*, Thunb.," but it does not have the aspect of that species. Ivy Range, Moodies, Barberton, tree, fls. white, *Thorncroft*, 345; Houtbosch, *Rehmann*, 6511 and 6517.

Gymnosporia sp.; (syn. *Celastrus angularis*, Sond.).—"Transvaal," *Dr. Sutherland.*

Gymnosporia botsabelensis, *Loesener* in *Bull. Herb. Boiss.* v. 4. p. 429 (1896).—"Transvaal." No specimen at Kew.

Gymnosporia buxifolia, (*L.*), *Szyszyl.* var.—Near Pretoria, Dec. 1883, *Wilms*, 219; Pretoria, Aapjiespoort, *Rehmann*, 4082; Matebe Valley, *Holub;* Shilouvane, "taillis, shrub 1–2 m. Sept. 1899," *Junod*, 579. At Kew the above have all been placed under *Celastrus buxifolius*, var. *empleurifolius*, (E. & Z.), Sond.

Gymnosporia condensata, *Sprague*.—Small tree, Oliphants River, Nov. 1905, *F. H. Hurley*, No. 1 (type),

Gymnosporia deflexa, *Sprague*; "Transvaal Saffraan."—Woodbush, Oct. 1905 (in flower), *A. P. Grenfell*, 4 (T. D. A. herb. 1142, type); Houtboschberg, Patatabosch, near stream, Jan. 5 (fruit), 1906, alt. 4,750 ft., *Davy*, 5077. A large tree with yellow inner bark and at one time mistaken for *Elaeodendron croceum*, the Cape Saffraan, which has not yet been recorded from the Transvaal.

Gymnosporia fasciculata, *Loesener*.—No Transvaal specimens at Kew. Reported from Barberton.

Gymnosporia heterophylla, (*Eckl. & Zeyh.*) *Loesener*.—Near Lydenburg Town, Sept. 1885, *Wilms*, 222.

Gymnosporia nemorosa, (*E. & Z.*) *Szyszyl.*; (syn. *Celastrus nemorosus*, E. & Z.).—Between Delagoa Bay and Pretoria, in fruit Aug. to Sept. 1886, *Bolus*, 7698.

Gymnosporia polyacantha, (*Sond.*) *Szyszyl.*; (syn. *Celastrus polyacanthus*, Sond.).—Pretoria, Aapjiespoort, *Rehmann*, 4080; Nylstroom River, "shrub in thick bush," *Nelson*, 107.

Gymnosporia tenuispina, (*Sond.*) *Szyszyl.*; (syn. *Celastrus tenuispinus*, Sond.).—Magaliesberg, in flower Dec., *Burke*, 120 (type in herb. Kew).

Gymnosporia luteola, (*Delile*) *Szyszyl.?*; (syn. *Celastrus luteolus*, Delile).—Houtbosch, *Rehmann*, 6518; at Kew this sheet has been placed with *G. undata*, (Thunb.) Szyszyl., and I supposed it was that species, not recollecting that Szyszylowicz had placed it under the tropical African species *G. luteola*.

Gymnosporia Zeyheri, (*Sond.*) *Szyszyl.*; (syn. *Celastrus Zeyheri*, Sond.).—"Beim Grossen Wasserfall bei der Stadt Lydenburg," Aug. 1890, *Wilms*, 225; this has been so named at Kew.

Gymnosporia, sp. nov. (near *G. acuminata*, but leaves usually quite entire).—Houtboschberg, Patatabosch, near stream at 4,750 ft. alt., *Davy*, 5117 (T. D. A. herb. No. 1197); Sabie-hoek Forest, Lydenburg Dist., 4,100 ft., *Davy*, 5208 (T. D. A. herb. 1544a) and *Davy*, 5290 (T. D. A. herb. 1524); Pilgrim's Rest, Van der Merwe Bush, interior of forest, *Davy*, 5203 (T. D. A. herb. No. 1433).

Gymnosporia sp.?—Houtboschberg, Hoek-van-hel-bosch, alt. about 5,000 ft., Jan. 7, 1906, *Davy*, 5156 (T. D. A. herb. No. 1236).

Pterocelastrus Galpinii, *Loesener* in *Bull. Herb. Boiss.*, v. 4, p. 431.—Barberton, amongst shrubs on hillsides in shaded ravines, Reimers Creek, alt. 3,000 ft., "shrub 10 ft., in flower Aug. 1887," *Galpin*, 448 (type in herb. Kew).

Pterocelastrus, sp. nov. ?—Houtbosch, *Rehmann*, 6055.

COMBRETACEAE.

Combretum Kraussii, *Hochst.*—Barberton, Reimer's Creek and Makwongwa Forest, 3,000 ft. alt., tree 15 ft. or more, Feb. 1890, in fruit, *Galpin*, 796, in herb. Bolus.

EBENACEAE.

Diospyros mespiliformis, *Hochst.*—Crocodilepoort, near Barberton, alt. 2,000 ft.. tree 20 ft., in flower Oct. 1891, *H. Pauling*, ex herb. Galpin, 1354; Mathibis Kom inter Lourenco Marques et Komatie River Drift, Aug. 1886, arbor 40–50 pedalis, *Bolus*, 7847; Leydsdorp, Thabina, near Tzaneen and Komatiepoort, *Davy*. Common in the Eastern middle veld of the Zoutpansberg, between 2,000–2,500 ft. alt., a conspicuously large tree with dark foliage, usually occurring on ant-heaps in grey soil. Fruit eaten by Kaffirs.

Euclea divinorum, *Hiern.*—Crocodile River, near Louws Creek, 1,400 ft. alt., Sept. 1886, *Bolus*, 1311.

Euclea Guerkei, *Hiern.*—Farm, Rustplaats, near Lydenburg, Nov. 1886, *Wilms*, 916 (type, in herb. Kew).

Euclea lanceolata, *E. Mey.*—Magaliesberg, Nov., *Burke*, 379; *Zeyher*, 1123; near Middelburg, Dec. 1883, *Wilms*, 218; Pretoria, Aapjiespoort, *Rehmann*, 4210, 4216, 4214; Boschveld, Minaars Farm, *Rehmann*, 4857; Shilouvane, Sept. 1889 (?), shrub 1–2 m., *Junod*, 641 A; Wonderboom Farm, alt. about 4,100 ft., Aug. 6, 1904, *Davy*, 2284.

Euclea macrophylla, *E. Mey* (var. ?).—Barberton, Kaap Valley, 2,000 ft. alt., March 1891, "tree 15 ft.", *Galpin*, 1329.

Euclea natalensis, *A. DC.*—Barberton, hillsides among rocks, 2,200 ft., shrub 4–6 ft., fls. Aug.–Sept. 1889, *Galpin*, 484.

Euclea ovata, *Burch.*—Houtbosch, *Rehmann*, 6053.

Euclea undulata, *Thunb.*—Zoutpansberg, "on the redsand flats to the west of Blaauwberg and Hangklip Mountains, south of the Limpopo River, Nov. 4, 1871." "Tolangoola (Tslangoola ?) or Jwarry-Bush, sweet well tasted berry," *T. Baines.*

Royena ambigua, *Vent.*—Pretoria, Wonderboompoort, *Rehmann*, 4527.

Royena cordata, *E. Mey.*—There is no Transvaal material at Kew. McLea's Pretoria specimen so cited by Hiern appears to be *R. Wilmsii*, Gurke, judging by *Wilms*, 923, cited by Hiern; but dissections were not made.

Royena Galpinii, *Hiern.*—Barberton, grassy plains and hillsides, 2,800–4,000 ft., fls. creamy white, Oct.–Nov. 1889, *Galpin*, 603 (type in herb. Kew). Leaves densely rusty-tomentose beneath, in aspect somewhat resembling *Vangueria infausta* except for the difference in colouring of the pubescence.

Royena hirsuta, *L.*—Watervall Riviere, near Lydenburg, Sept. 1885. *Wilms*, 919; *Rehmann*, 4334, in herb. Kew; Pretoria, colles supra Aapies River, is so labelled by Hiern, but appears to be *R. villosa*, which see.

Royena lucida, *L.*—No Transvaal material at Kew.

Royena nitens, *Hiern.*—Barberton, grassy plains, 2,800 ft., "ripe fruit, oblong, plum colour," shrub 1½–2 ft., fls. Sept.–Oct., 1889, *Galpin*, 568; in monte Sheba, prope Barberton, ca. 3,900 ft., Sept. 1886, *Bolus*, 7842 (fls. "white").

Royena pallens, *Thunb.*—Pretoria, Aapjiespoort, *Rehmann*, 4090, 4091; "Transvaal," *Dr. Emil Holub*, in herb. Kew (received May, 1883); Crocodile River, Nov., *Burke*; Johannesburg, ridges above Jeppe's Town, alt. about 6,000 ft., Sept. 1898, *D. F. Gilfillan*, ex herb. Galpin, 6042; near large waterfall, near Lydenburg, Oct. 1892, *Wilms*, 921; near Barberton, banks of Crocodile River, alt. 1,500 ft., shrub 2½ ft., Sept. 1890, *Galpin*, 1094 (labelled "*R. sericea, Burch.*"); Shilouvane, plains, shrub 1–2 m., Sept. 1899, *Junod*, 622; Vaal River at Bloemhof, *Davy* ("Blaauwbosch").

Royena (sp. nov. ?).—My 5204 (immature) from Warmbaths, Jan. 1906, appears to be nearer to *R. usambarensis*, Gurke, than to anything else at Kew, but the leaves of the Kew specimen (*Gurke*, 2162a) are shorter and more abruptly acute, with longer petioles and distinctly hirsute shoots.

Royena villosa, *L.*—No Transvaal material at Kew (unless *Rehmann*, 4334 is this, "Pretoria colles supra Aapies River"); the leaves are more obtuse and broader than in *R. hirsuta*, but smaller than in typical *R. villosa*.

Royena Wilmsii, *Gurke.*—Near Pretoria, Dec. 1883, *Wilms*, 923; "In collibus prope Pretoria," alt. 4,100 ft., Sept., *J. H. McLea*, ex herb. Bolus, 3103, in herb. Kew. In *Flora Capensis* Hiern has called this specimen *R. cordata*, and has so marked the Kew sheet, but it is totally different from that species as recognised by him in other cases. This is the species of the Houtboschberg forests known to us as *R. lucida*, the "Zwaart-bast" of the Cape.

EUPHORBIACEAE.

Antidesma venosum, *E. Mey.*—Avoca near Barberton, *Galpin*, 1249, "shrub 10–15 ft."; this is a form with very obtuse leaves, and the Kew sheet is marked as "= Monteiro, Angola specimens"; Lydenburg District, between Spitzkop and Komatie River, *Wilms*, 206.

Bridelia micrantha, *Baill.*—Rehbokdraai, between Nelspruit and Spitzkop, 3,300 ft. alt., *Davy*, 3205; Zoutpansberg, streamlet

flowing from Pisangkop, "a fine tree, one seed in each berry," *Nelson*, 36; Shilouvane, Colline, tree 3–6 m., *Junod*, 682. This is the "M'Tserrie" of the Zoutpansberg, celebrated for its durable, termite-resistant wood. There are, also, at Kew, specimens from Natal, Inanda, "a small tree"; Lagos, "bark medicinal, called 'Iva,'" *H. Millen*, 104; Gold Coast, a "tree about 50 ft."; Sierra Leone, "common in forest, 'Egira,' the pulp of wood, made by boiling, is used for open sores," *G. F. Scott Elliot*, 1891–92. Specimens referred to *B. Zenkeri*, Pax, appear to resemble it closely.

Bridelia stipularis, *Blume*.—Macaliesberg, May, *Burke*; Makapansberg, Streyd-poort, *Rehmann*, 5393. In the field, and when not in flower or fruit, this may perhaps be overlooked for *Vangueria infausta*, or *Combretum Zeyheri*, on account of the form of its leaves.

Croton gratissimum, *Burch.*—Macaliesberg, *Zeyher*, 1513; Rhenosterpoort, Nylstroom River, *Nelson*, 93; Babiaan's River, Nov., *Burke*; Wonderboompoort, Warm Baths, between Pietersburg and Woodbush Village, &c., *Davy*. One Magaliesberg specimen has leaves less lanceolate, more oblong and obtuse than in the type, but this character is not constant. There are also the following specimens at Kew:—Natal, *Gerrard*, 1460, and Kuruman "in lapidis alt. 1,200 m., Feb. 1886"; *Marloth*, under the name *C. microbotryus*, Pax.

Euphorbia Reinhardtii, *Volkens*.—Smits Drift Valley, Haenertsburg, 4,000 ft. alt., Jan. 1906. Called "Mokaw' de" by Kaffirs, "Melk-boom" by the Dutch. The milky juice is described as "skellum," *i.e.*, injurious.

Excoecaria africana, *Mull. Arg.*—My specimens from Louw's Creek, Barberton, appear to agree well with material from Natal and Zululand, so named at Kew. Near Rustenburg, rocky hillsides, a "tree," *Miss Pegler*, 974, in herb. Bolus. It is also said to occur in the Waterberg. There is at Kew material of what seems to be an undescribed species from Natal.

Phyllanthus sp.—Not uncommon along streams of the eastern middle veld below 2,000 ft. alt., Louw's Creek, Barberton, near Leydsdorp; the Matopos, South Rhodesia. I do not find any *Phyllanthus* at Kew to match this, and it may be something quite different, but flowers and fruit are needed.

Phyllanthus verrucosus, *Thunb.* var.—Barberton, dry hillsides 3,000 ft., "much branched shrub 5–8 ft.", *Galpin*, 686.

FLACOURTIACEAE (Bixaceae of *Flora Capensis*).

Dovyalis sp. (*Aberia Zeyheri*, Sond.)—Crocodile River, fls. Nov., *Burke*, 272; Pretoria, Aapiespoort, *Rehmann*, 4097; Houtbosch, *Rehmann*, 6020.

Gerrardina foliosa, *Oliv.*—Barberton, Saddleback Range, 4,000–5,000 ft., fringing woods at the summit of mountain ravines, fls. Sept., 1889, densely leafy shrub, 3–5 ft., *Galpin*, 473. (The leaves resemble those of a *Myrica*.)

Kiggelaria africana, *L.*—No Transvaal material at Kew. Houtboschberg, one of the most abundant trees in the lower forest (4,250–5,000 ft. alt.), called "um-Pata" and "Spekhout," *Davy*, Jan. 6, 1906. Probably gives its name to the forest now known as the Pata(ta)bosch, near Haenertsburg.

Kiggelaria dregeana, *Turcz.*—No Transvaal material at Kew.

Oncoba spinosa, *Forsk.*—No Transvaal material at Kew. "Tongwan Spelonken," Nov. 16, 1906. Called "Tongwan." The Zulus make snuff-boxes of the seed pods, while the Bavenda string them to ankle bands used at dancing. "Tree grows in the form of and about the size of an orange tree." *F. T. Menne*, 3044, in T. D. A. herb.

Scolopia Ecklonii, (*Arn.*) *Warb*; (syn. *Phoberos Ecklonii*, Arn.)—Houtbosch, Transvaal, *Rehmann*, 6464. Leaves sparingly and irregularly erose dentate, coriaceous, margins revolute.

Scolopia Zeyheri, (*Arn.*) *Warb.*—No Transvaal material at Kew.

Trimeria grandifolia (*Hochst.*) *Warb.*; (syn. *T. alnifolia*, Planch.)—Forbes Reef Bush, Swaziland, at edge of bush, Jan. 1, 1905, *Davy*, 2737. No Transvaal material at Kew,

Trimeria trinervia, *Harv.*—No Transvaal material at Kew.

Xymalos monospora, (*Harv.*) *Baill.* in *Bull. Soc. Linn. Paris.* i. 850 (1887); syn. *Xylosma monospora*, Harv., vide *Ic. Pl.* 2444 s.n. *Xylosma*; *Myroxylon monospora*, Forst.; *Toxicodendron acutifolium*, Benth., in *Journ. Linn. Soc. Bot.* xvii. 214, type in herb. Kew). The lemonwood or Borie.—Houtboschberg, "shrub," *Nelson*, 428. Range: Transvaal, Natal, Kaffraria, Amatola Mts., Orange River Colony, Victoria East, Ruwenzori Uganda (Kalungi woods). Placed in the family *Monimiaceae* at Kew. One of the most abundant trees in the mist-belt forests; the wood being considered poor in quality is seldom cut by woodmen.

HAMAMELIDACEAE.

Trichocladus crinitus, *Pers.*—No Transvaal material at Kew.

Trichocladus grandiflorus, *Oliver*, in *Ic. Pl.* 1480.—Barberton, wooded ravines, Moodies, alt. 3,500–4,000 ft., tree 15–20 ft., fls. white, handsome, Sept. to Oct., 1889, *Galpin*, 553; South Africa ("Berg Plateau"), *C. Mudd* (type in herb., Kew); Moodies, Transvaal, *Mrs. Royston*, ex herb. Medley Wood, 4084; Sabiehoek Forest, *Davy*, 5206; Graskop, near Pilgrim's Rest, upper edge of berg, *Davy*, 5207. Seems to occur most frequently on the borders of the forests; flowers ornamental; a small tree worthy of cultivation. Called "Underbush" or "Onderbosch."

ICACINEAE.

Apodytes dimidiata, *E. Mey.* "White Pear."—Barberton, Bearded Man Mt., tree 15 ft., alt. 4,200 ft., Apr, 1890 (fls.), *Galpin*, 903; Pilgrim's Rest, Van der Merwe Bush, *Davy*, 5208 (alt. 5450–5750 ft.). Natal "local name, Bird's Eye; tree, fruit bright red, black projections," *Nelson*, 21, "very showy."

LAURACEAE.

Cryptocarya (Siebertiana, *Engl.* ?).—A common tree of the mist-belt forests, which I have not yet been able to collect either in flower or fruit, is evidently a *Cryptocarya*. It does not match any South African material at Kew, but the foliage is very like that of Buchwald, 167 and 492 from Usambara, labelled *C. Siebertiana*, Engl., at Kew. Until flowers and fruits of our tree have been compared with the type at Berlin, it will be best to retain this as a tentative name. I have collected it as follows:—Patatabosch, near stream, 4,750 ft. alt., Jan. 5, 1906, *Davy*, 5094 and 5096, approach closely to Buchwald's specimens; Houtboschberg forests, 4,000–5,500 ft. alt., June 11, 1905, *Davy*, 5209; Lydenburg District Van der Merwe bush, 5,400–5,750 ft. alt., Jan. 30, 1906, *Davy*, 5210.

LEGUMINOSAE.

Acacia arabica var. **Kraussiana**, *Benth.*—Macaliesberg, *Burke*, 270; Wonderboom farm, near Pretoria, *Davy*; Potgieter, Leydsdorp, Louw's Creek, *Davy*. Apparently not common, though widely distributed. Yields gum. The typical form of *A. arabica* appears to be confined to north and tropical Africa.

Acacia ataxacantha, *DC.*—Borders of forests, Haenertsburg, Pilgrim's Rest, &c. My specimens agree well with tropical African material; there are no other Transvaal specimens at Kew, and this appears to be the first record of its occurrence in South Africa.

Acacia Burkei, *Benth.* "Aapjies-doorn" (No. 126, species "E" of my list).—Macaliesberg, *Burke*, 126; "tree fls. Oct. and Dec." (type), *Zeyher*, 571, 164–10; Savannah country near Nylstroom and Potgieter, 3,600–4,000 ft. alt., *Davy*; Manganja hills, Zambesia, "fine tree, 30–40 ft. high; wood not hard, but tenacious, used by natives for hoe handles, &c.", *Meller*, 9, in herb. Kew.

Acacia caffra, *Willd.*—Makapansberg, Streydpoort, *Rehmann*, 5516; Pretoria, Wonderboompoort, *Rehmann*, 4603; Houtbosch, *Rehmann*, 6272; Barberton, hillsides, Queen's River Valley, alt. 2,300 ft., Sept. to Oct., 1889, "tree 15 ft.," *Galpin*, 546; all in herb. Zurich; Arcadia, Pretoria, *Davy*, in herb. Kew. There are also at Kew specimens from Natal; Kaffraria; Gross Namaland; Clanwilliam; Kalahari; Hereroland; N'Gamiland (Kwebe, "bush seldom above 8 ft. high, fls. white, bark of branches white, local name 'White Thorn'," *Lugard*, 93; Tamalakane River, "Buffeldoorn Acacia," *Jos. McCabe*, 29). One of the most abundant species on kopjies and talus slopes in the western middle veld; often flowering when merely a bush, sometimes becoming a large tree. It is uncertain whether all the Zurich specimens belong to this species, as it and *A. eriadenia* have there been treated as one.

Acacia Catechu, *Willd.*—Our largest species of Acacia, forming a handsome and striking tree on the river banks of the eastern middle veld between 2,000 and 2,500 ft. alt. Thabina River, common between Thabina and Tzaneen, called "White Thorn,"

June 15, 1906, *Davy*, 5211 (T. D. A. herb., 2636); banks of the Middle Letaba River, between Kelly's store and Frazer's store, tall trees with trunks up to 1½ and 2 ft. diameter, *Davy*, 5212 (T. D. A. herb., 2547).

Acacia delagoensis, *Harms.*—Umbolosi, *Schlechter*, 11718, in herb. Zurich. Probably extends into the low veld of the Transvaal. Apparently near to *A. Burkei*. *Bolus*, 7755, "Crocodile River Drift inter Komatie River Drift et Barberton, Aug., 1886," should be compared with this.

Acacia detinens, *Burch.*—Appears to be exclusively western in distribution. Pniel, Vaal River, *W. Roe*, in herb. Bolus, 2070. The only Transvaal specimens I have seen growing were near the Vaal River, between Christiana and Fourteen Streams, and these only bore a few old legumes; without better material their identity is uncertain. There are specimens so named in herb. Zurich, from Amboland, Gross Namaland, and Hereroland, but none from the Transvaal. *A. Fleckii*, Schinz, of the "Kalahari," appears to be very near to *A. detinens* but more slender; it is possible that our specimens belong to it, but I had none at Zurich for comparison. Burchell's name applies very appropriately to our bush, whatever it may be.

Acacia eriadenia, *Benth.*—Resembles pubescent forms of *A. caffra*, and at Zurich the two have been treated as one. Crocodile River, Nov., *Burke & Zeyher*; (types) Houtbosch, *Rehmann*, 6273, 6274; Woodbush village, in dry, open, scrub country, "resembling *A. caffra*, but spike larger and more dense; Sesutu name 'Molouva,' Jan. 4, 1906," *Davy*, 5133 (T. D. A. herb., 1213); near Lydenburg, *Wilms*, 447; Leydsdorp, *Davy*; farm "Wolverand 383," between Klerksdorp and Wolmaransstad, Feb. 10, 1904, *Davy*, 1534 (locally called "Wacht-'n-bietje").

Acacia erioloba, *E. Mey.* = *A. Giraffae*, Burch.

Acacia ferox, *Benth.* "Hoek-doorn."—Aapjies River and Macaliesberg, Sept. (in fruit), *Burke* (type); "Transvaal," *A. P. Grenfell*, 5; between Koobie and Shaw's Valley, Bechuanaland, *Baines*.

Acacia Gerrardi, *Benth.*—Boschveld between Eland's River and Klippan, *Rehmann*, 5028. No. 125 of my list (near Barberton, 1,000 ft. alt.) belongs here, and also Nos. 124 from the Zoutpansberg District, and 130 from the Springbok Flats and Shilouvane. This is the second of the two species common on vlei lands on the Springbok Flats, Waterberg District (*Davy*, 4073, May 18, 1905). When in fruit it is readily distinguished from *A. spirocarpoides* by the falcate, not twisted pod, and the less flattened crown; it is known as the "Rooi-doorn" or "Rooi-bast," and the wood is considered more durable than that of *A. spirocarpoides*, which is said to be used only for fuel.

Acacia Giraffae, *Burch.* "Kameel-doorn."—Common in the Savannah country of the Waterberg and south-western districts; also common in Bechuanaland, Gross Namaland, and Hereroland. No Transvaal specimens at Kew.

Acacia glandulifera, *Schinz.*—British Central Africa, Kwebe Hills, near Lake Ngami, N'Gamiland, 3,000 ft. alt., *Mrs. E. J. Lugard*, 14, 16, who notes that it is a bush 6 ft. high ; the capitate, yellow flowers were collected Aug. 16, 1897, the fruit Sept. 27, and the leaves Feb. 8, 1898. I have collected it at Potgieter in the Waterberg district (about 4,000 ft.), Leydsdorp in the Zoutpansberg district (2,000 ft.), and near Bremersdorp in Swaziland (2,700 ft.). Though it is thus widely distributed it does not appear to be common with us. I have only found it in bush form, from 4 to 6 ft. high.

Acacia hebeclada, *DC.*—Vaal River, May, *Burke*, 522 ; Aapjies River, *Zeyher*, 569 ; extending to Lake River, N'Gamiland, *Lugard*, in herb. Kew ; Griqualand West ; Gross Namaland ; Hereroland and "Kunene-Zambesi Expedition" (herb. Zurich).

Acacia heteracantha, *Benth* ?).—The type specimen of *A. heteracantha* is barren and very incomplete, but Burchell's label describes it as a "tree of 20 ft., legume like that of *A capensis*" (*i.e.*, *A horrida*, Willd.). I have seen no Transvaal material which can be referred here with certainty.

Acacia horrida, *Willd.* "Zoetdoorn ; Sweet thorn."—Of this, the most common and widely distributed of our Acacias, the only Transvaal material at Kew is *Nelson*, 214, from Bloemhof, an incomplete specimen. This and my own specimens from the dry western and south-western districts agree well with those from Cape Colony, being equally glabrous.

The form met with in moist soils at the foot of kopjies, or near fonteins and streams, around Pretoria and on the high veld, is pubescent on the younger parts, which character appears to be constant ; in no other respect does it seem to differ from the typical form. As a geographical variety I think it is well to give it a distinctive appellation and therefore propose to call it var. *transvaalensis*, Davy, var. nov. The young bark is orange-brown, but becomes almost black in age ; it is remarkably tough, and is often stripped for use as rope or cordage and in basket work ; I have seen the broken leg of a cow deftly and firmly bandaged with it. The spines are as variable in size as those of *A heteracantha ;* some shoots are spineless, others bear spines three to four inches long, and of an ivory whiteness. The flowers are borne in large panicles, are deep yellow and powerfully fragrant, hence the vernacular name.

Acacia lasiopetala, *Oliver* (?).—I have collected what may prove to be this species at the White River Settlement, Barberton District, *Davy*, 5213, and Thabina, Zoutpansberg, *Davy*, 5214. It agrees with *Buchanan*, 32 of 1881, "large tree, fls. white, Shiré Highlands, Zambesia" ; also with his 32 of 1891 and 93 of 1878 from Blantyre, "large tree, fls. white, gum exudes from trunk and branches." In foliage and pubescence it is much like *A. Rehmanniana*, Schinz, but the legumes are large and woody, in shape a little approaching those of *A. hebeclada* but longer, glabrous and shining. The bark is quite different from that of *A. Rehmanniana*, being pale yellow, soft and papery, at length flaking off.

Acacia amboensis, Schinz and *A. Stuhlmanni*, Taub., resemble *A. lasiopetala* and *A. Rehmanniana* in the yellow colour of the hairs, but *A. Stuhlmanni* is patently hirsute and the legumes are densely appressed hirsute.

Acacia natalitia, *E. Mey.*—Komatie River, *Davy* (No. 133, species "M" of my list). Nearly related to *A. horrida*, but apparently a valid species, distinguished by the much narrower leaflets and characteristically pale bark, as compared with the dark-brown, almost black, bark of *A. horrida*. "In fruticet. pr. Mailieus Kep. 2,300 ft., 17/11/94" *R. Schlechter*, 4818, in herb. Zurich.

Acacia pallens, *Rolfe* (*A. nigrescens* var. *pallens*, Benth). The type specimens both of *A. nigrescens* and of var. *pallens* are from Zambesia, and in each case they are very incomplete. Additional material from the Transvaal enables Rolfe to separate the latter as a distinct species to which all our material so far collected, appears to belong. I have incomplete winter specimens from Topsi, Bechuanaland, which may belong to *A. nigrescens*, but it is impossible to say definitely until foliage has been collected from the same locality. This is one of our most important timber trees, and is largely cut for mine props under the name of "Knop-jies-doorn" or "um-Kai." The prickles persist for many years on the main trunk and branches, effectually arming the tree, though to what advantage is not evident. The type of "var. *pallens*" is from "opposite Pita, near Senna," Zambesia, April, 1860, *Kirk*, 201, "a tree 30 ft., very hard, heavy wood used for clubs."

Acacia Rehmanniana, *Schinz* (No. 129, species "H" of my list). —The type is *Rehmann*, 5517, from Streudpoort, Makapansberg; my specimens from Marabastad near Pietersburg, were collected only a few miles from the same locality; I have also gathered it along the Sand River, beyond Pietersburg. The bark is dark, hard, distinctly and coarsely striate and persistent. The Bulawayo specimen referred to in my list appears to belong here, but the White River tree is probably something else, perhaps *A. lasiopetala*, Oliver.

Acacia robusta, *Burch.*—Macaliesberg, *Burke*, 321. Bushveld between Elands River and Klippan, *Rehmann*, 5025; without locality (probably Macaliesberg) *Zeyher*, 562, 165·9; Wonderboom farm, Pretoria, *Davy*; Meintjes Kop, Pretoria, *Davy*; Crocodile River Drift, near Barberton, *Bolus*, 7756. Often seriously affected by the fungus *Aecidium inornatum*, Kalchbr. The leaves are also subject to the leaf-spot *Uromyces phyllodii*, Cooke and Massee; I am indebted to my colleague Mr. Pole Evans for the determination of these parasites.

Acacia sambesiaca, *Schinz.*—The Zurich type reminds me of a dwarf shrubby species common in heavy "black turf" soils on the Springbok Flats, Waterberg District, 4096–4097, but there were no specimens for comparison.

Acacia spirocarpa, *Davy* in list, not of Hochst. = *A. spirocarpoides*, Engl.

Acacia spirocarpoides, *Engl.* (No. 127, species 'F.' of my list).—Boschveld inter Elands River and Klippan, *Rehmann*, 5022, 5026, in herb. Zurich. This appears to be the common species of the Springbok Flats, Waterberg District (3,500 ft. alt.) with umbrella-like crown and much-twisted pods; Marico District, Rustenburg road between Zeerust and Leo's store, "a small bush," not common, *Davy*, 118. A tree with similar habit occurs at Louw's Creek, near Barberton (about 1,100 ft. alt.), *Davy*; Crocodile River drift, between Komatie River and Barberton, *Bolus*, 7754. The north African *A. spirocarpa*, Hochst., to which I tentatively referred our tree, does not appear to occur so far south. The tree reported by Marloth from the Kalahari under the name *A. tortilis*, is probably *A. spirocarpoides*; it is doubtful whether the North African *A. tortilis* reaches South Africa.

Acacia stolonifera, *Burch.*—This appears to be a valid species; though near to *A. hebeclada* the habit is quite different. Not uncommon between Klerksdorp and our western border, but there are no Transvaal specimens at Kew. Kalahari 1891, *Dr. Fleck*, 410a, in herb. Zurich.

Acacia uncinata, *Engl.*—Boschveld, inter Elands River. and Klippan, *Rehmann*, 5024, in herb. Zurich. Related to *A. robusta*, pods smaller, peduncles long. Also in Hereroland. I collected a specimen at Bulawayo, S. Rhodesia, which may belong here.

Acacia (verugera, *Schweinf.*?) *Davy*, in list = *A. xanthophloea.*

Acacia xanthophloea, *Benth.* in *Trans. Linn. Soc. Bot.* xxx. (1875) 511 (not included in the *Flora of Tropical Africa*). The "Fever-tree" of the Transvaal low veld. The type locality is Senna, on the Zambesi, *Kirk* (fruit); marsh, Zomba at the east end of Lake Shirwa, *Meller* (flowers). The Senna specimens agree well with ours; they are described as from a "large tree yellow bark, yields gum, soft wood." It also occurs in Northern Nigeria, *Elliott*, 163; Shire Valley, "tree 30–50 ft., bark shining yielding gum," *Lidcott*; Chiloane, S. E. Africa, *Scott Elliot*; Ruwenzori, "the common *Acacia*, Kidung valley and Vaivasha, 6,000 ft. alt.; tree 40 ft.," *Scott Elliot*. I have also seen what appears to be the same tree in the "Death Valley," near Wankie, S. Rhodesia, and it has been reported from swampy ground at the Matopos.

In the Transvaal it has been recorded only as occurring in the low veld, in swamps along the Komatie and Crocodile Rivers below about 1,000 ft. alt.; these habitats are naturally the most fever stricken in the country and the tree is therefore supposed to have some connection with fever, hence the common name "Fever tree." The bark of the main trunk and branches ex-foliates, leaving a layer of new bark of yellow colour and powdery surface, as though covered with a lichenoid growth. Associated with the smells of sub-tropical swamp growth, the jaundiced appearance of these ghostly trees waving in the pale moonlight produces a sickly feeling sufficient to warn the traveller against sleeping in their vicinity. In 1903 there were a few fine trees along the Komatie River near Komatiepoort, but these have since been felled in an

effort to clear the bush and make the village more sanitary. A few may still be seen from the railway, between Komatiepoort and Kaapmuiden.

Acacia Davyi, *N. E. Brown* ; affinis *A. Gerrardi*, Benth., sed glabra, spinis longioribus, pinnis 8–10–jugis, foliolis minoribus et legumine recto differt.

Arbor glabra vel pedicellis minute puberulis. Aculei nulli. Stipulae spinescentes, rectae, 4–22 mm. longae. *Folia* bipinnata, 7–16 cm. longa, petiolo inter pinnas 1–2 inferiores interdum glandulifero ; pinnae 10–18–jugae, 2–5 cm. longae ; foliola 20–36–jugae, 2–6 mm. longa, 0·6–0·75 mm. lata, linearia, obtusa, *Pedunculi* auxillares, fasciculati, involucello deciduo ad medios instructi. *Flores* globoso-capitati, lutei. *Calyx* minute ciliaris, petalis paulo brevior. *Legumen* 6–10 cm. longum, 6–7 mm. latum, rectum, planum, glabrum, valvis tenuiter subcoriaceis. (No. 128, species "G" of list.)

Transvaal ; near Woodbush (Houtbosch), *Rehmann*, 6276, 5132 ; Zoutpansberg, *Junod* in T. D. A. herb. 1323 ; Swaziland, near Bremersdorp, alt. 2,700 ft. *Davy*, 3024. A solitary tree with deep yellow flowers resembling those of *A. horrida*, but entirely without fragrance, Jan. 4, 1906 ; bark light-brown and papery, *Davy*, 5132 (T. D. A. herb. 1211). This species is nearest to *A. natalitia*, but differs in several points.

Bauhinia reticulata, *DC.*—My Zoutpansberg specimens match well with tropical African material. It is common as a shrub or small tree near Tzaneen and Thabina at 2,000 to 2,500 ft. alt.

Cassia abbreviata, *Oliv.* "Mulumanyama."—Spelonken, Zoutpansberg, *F. T. Menne* in T. D. A. herb. 3046. There are also at Kew the following specimens :—Zambesia "a tree sometimes 40 ft. high, a mass of yellow ; has a long seed pod ; 'M'roovay,'" *C. E. F. Allen*, 35 ; Shiré Highlands, *Buchanan ;* Tette, *Kirk ;* Bechuanaland, *Baines ;* Nyasaland, *Coetzee*, 84 ; Rovuma River ; Usambara (Steppenbosch).

Cassia delagoensis, *Harv.*—Barberton, 2,800 ft., "shrub 3 to 6 ft., fls. orange yellow," *Galpin*, 878 ; Cave Mts., Rhenosterpoort, Groot Spelonken, *Nelson*, 415 ; near Nelspruit, *Davy.*

Lonchocarpus capassa, *Rolfe* (in Oates "Matabeleland" ed. 2, p. 397).—The type was collected by Oates in Matabeleland. Our Transvaal specimens (Barberton, *Galpin ;* Modjajies Mt., Zoutpansberg, *Davy*, 5215) appear to agree with typical material, but either the species is very variable, or there is a good deal of something else mixed with it at Kew. The following specimens are so labelled :—Huilla, Angola ; Shire Highlands ; Lake Ngami ("tree 15 to 20 ft. high—trunk 6 or 7 ft. in circumference—with pink flowers. Grows on the Tamulekan River, *McCabe*) ; Zambesi ("small tree") ; Victoria Falls, "Moogorrowa," straight growing, pyramidal shape, on the banks of the river, *Allen*, 47. The flowers are variously described by collectors as pink, mauve, purple, or with light blue claw and light orange limb !

Mimosa asperata, *Linn.* (No. 132, species "L" of my list).—Farm "Wolverand 383" between Klerksdorp and Wolmaranstad, Feb. 10, 1904, *Davy*, 1535.

Pterocarpus sericeus, *Benth.*—Aapjies River, Oct., *Zeyher*, 351 (type); Kaap River Valley, Barberton, 2,000 ft., "tree 15–20 ft., fls. orange-yellow, sweetly scented, Dec. 1889, fruits Mch," *Galpin*, 730; Duivells Kloof, near Fraser's store, Zoutpansberg, 2,700 ft., a large tree, *Davy*, 5216; Streydpoort, Makapansberg, *Rehmann*, 5523. A common and characteristic tree or shrub in the Eastern middle veld of the Zoutpansberg.

LOGANIACEAE.

Buddleia auriculata, *Benth.*, var. **euryifolia**, *Prain.*—Barberton, *Galpin*, 970, *Thorncroft*, *Davy*; Lydenburg, "in verlassenen Kaffern kraalen," June, 1883, *Wilms*, 1030.

Buddleia Lindleyana, *Fort.* Lydenburg, *Wilms*, 1028.

Buddleia salviaefolia, *Lam.*—Macaliesberg, Sept., *Burke*, 376; Mac-a-Mac goldfields, 1874, *J. H. McLea*, 467; near Spitzkop, Lydenburg, Aug. 1884, *Wilms*, 1027; near Lydenburg Stadt, Aug. 1887, *Wilms*, 1027 (bis); Barberton, *Galpin*.

Chilianthus dysophyllus, *Benth.*—Barberton, Reimer's Creek, 3,200–4,000 ft., "climbing shrub 5–12 ft.," July, 1890, *Galpin*, 971.

Chilianthus oleaceus, *Burch.* (syn. *C. arboreus*, Benth.).—Houtbosch, *Rehmann*, 6009.

Nuxia congesta, *R. Br.*—Barberton, *Galpin*; Woodbush, Oct., 1905, *A. K. Eastwood*, 5, "brittle wood" (becoming glabrescent in age); near Pretoria, Nov. 19, 1901, *J. W. C. Kirk*; Pretoria, 1875, *J. H. McLea*; Pretoria, Kuduspoort, *Rehmann* s.n.

Var. (syn. *N. pubescens*, Sond.).—Barberton, *Thorncroft*, 129; near Mac-a-Mac, 1874, *J. H. McLea*; Macaliesberg, June, *Zeyher*, 1326 ex parte (type), *Burke*, 259.

Var. (syn. *N. tomentosa*, Sond. in *Linnaea*, v. 23, p. 84).—Macaliesberg, June, *Zeyher*, 1326 ex parte (type); Kuduspoort, Pretoria, *Rehmann*.

Var. **brevifolia**, *Sond.* l. c. p. 83.—Macaliesberg, June, *Zeyher*, 1327 (type) = sp. nov.

Nuxia dentata, *R.Br.*—Shilouvane, shrub 6 to 9 ft., "M'Betane" and "Mosetane," *Junod*, 1430; Komatiepoort, 100 ft., *Schlechter*, 11738. (The Kew sheets bear the legend = "*N. oppositifolia*, Benth., and *N. Schlecteri*, Gilg.")

Nuxia floribunda, *Benth.* My specimens match well with typical *N. floribunda*; there is no Transvaal material at Kew.

MELIACEAE.

The African species of this family are badly in need of revision.

Ekebergia capensis, *Sparrm.*—It is doubtful whether we have this species in the Transvaal. My M'babane tree (2909) appears to belong to the next species.

Ekebergia Meyeri, *Presl.* "M'nyama."—Swaziland, hill-slope on road from M'babane to Mile's hot springs, Jan. 1905, *Davy*, 2909. Also at Barberton, Delagoa Bay and in Natal.

Pseudocedrela caudata, *Sprague*; ab congeneribus foliolis caudatis differt.

Arbor circiter 9 m. alta, ramis patulis versus apices pendulis, cortice cinereo, innovationibus tantum ferrugineo-tomentosis. *Cicatrices foliorum* depresso-cordiformes, cicatricibus fasciarum tribus notatae. *Folia* 4–6-juga, 15–20 cm. longa, petiolo pubescente 4–5 cm. longo incluso, petiolulis puberulis 0·8–2·5 cm. longis gracillimis; foliola ovata, basi inaequalia, acutissime caudato-acuminata, 3–5·5 cm. longa, 1·2–2·5 cm. lata, chartacea, utrinque superne manifestius reticulata, subtus nervo medio puberula ceterum glabra, nervis lateralibus utrinque circ. 10. *Capsula* subcylindrica, 14–19 cm. longa, utrinque, leviter angustata, medio 3–4 cm. diametro; valvae medio circiter 2·5 cm. latae, 3 mm. crassae, intus nitidulae, stramineae, extra brunneae, dense lenticellosae praesertim superne; columna sulphurea, acutiangulata haud vel vix ultra semina suprema producta. *Semina* pro loculo 2–6, 7·5–10·5 cm. longa, ala 1·8–2·2 cm. lata apice rotundata, corpore circiter 1·7 cm. lato. *Cotyledones* oblique ellipticae, 1·5–2·2 cm. longae, 1·1–1·4 cm. latae.

Transvaal, Blauwberg, Zoutpansberg, 3,900 ft., *Baily* in T. D. A. herb., 2926. Native name "Muchuss."

Trichilia (capitata, *Klotzsch.* ?).—Our specimens do not match the Kew material of this or any other species, the serration and pubescence of the leaflets being quite distinct; it cannot be identified until flowering and fruiting material is obtained.

Trichilia dregeana, *E. Mey.*, said to be the "Thunder-tree" of Natal. There is no Transvaal material at Kew.

Trichilia emetica, *Vahl.*; "Red Esschenhout; Maawa."—A handsome evergreen shade tree, well worth cultivation in frostless, warm-temperate regions; the seeds have a large, bright-red aril, and yield an oil highly valued by the Zoutpansberg natives. It is often noticeable that the ends of the limbs of large trees are lopped off, said to have been done by the natives when gathering the fruit. Barberton, Oct. 1905, *P. Oranje;* Avoca, near Barberton, 2,000 ft., "tree 30 ft. growing on river banks," Sept. 1890, *Galpin*, 1060. The following notes on extra-Transvaal sheets at Kew are worth record:—Delagoa Day, Sept. 1876, "fine tree—most common. Flowers very abundantly—sweet scented", *J. J. Monteiro*, 39; Shiré River, "a handsome tree. The seeds yield an oil and tallow of value and can be obtained in quantity. It is exported from Inhambane" *Dr. J. Kirk*, 76; Lupata, banks of Zambesi, Dec. 1858, "'Motsakin,' yields oil. The native name 'Mafura' means fat and is applied to many different oil seeds. The oil of this species, under the name of Mafura is said to be shipped

from Inhambane. It is used by natives in cooking. The tree common from the coast to Victoria Falls, along the Zambesi, also on Lake Nyasa and the Rovuma." *Dr. J. Kirk.*

Trichilia pterophylla, *D.C.* (1894), (syn. *T. alata*, N. E. Br. in *Kew Bull.*, 1896, p. 160).—Barberton, eastern slopes of Saddleback Mt. 4,500 ft., Dec. 1890, "a tree 25 ft.", *Galpin*, 1226. Woods, Upper Moodies, Barberton 4,400 ft., Oct. 1890, "a tree 20 ft.", *Galpin*, 1083 ; Sabie-hoek forest, Jan. 27, 1906, *Davy*, 5217.

Turraea sp. Tzaneen, Zoutpansberg, about 2,500 ft. alt. Aug. 1905, *J. B. Pole Evans* (T. D. A. herb. 3982), specimen incomplete.

MORACEAE.

Ficus Burkei, *Miq.*—Macaliesberg, *Burke* (type). My 2652 from the Magaliesberg near the Wonderboom, Dec. 9th, 1904, may be this, but does not match the type well. A specimen from the Woodbush collected by D. E. Hutchins may also belong here; the receptacles appear to be the same, but dissections are needed; the leaves are not quite like the type. There are no specimens at Kew which exactly match the type.

Ficus capensis, *Thunb.*—I have not seen Thunberg's type, but the Kew specimens from the type region (coast districts of Cape Colony and Natal) have much narrower leaves than our Transvaal specimens. The latter have been called by Warburg *F. capensis* var. *transvaalensis*, on sheets in the Zurich herbarium, but this name does not appear to have been published, and until we know what the type is like it is not certain that it is tenable. As at present understood, the species has a wide range of distribution, some forms extending into North Africa. Our Transvaal variety is common along streams of the eastern middle veld ; Lydenburg, bei Stephanus Schoeman's farm, Oct. 1887, *Wilms*, 1344 ; Houtbosch, *Rehmann*, 6487, 6488, 6489 ; Woodbush, 1903, "the large-fruited fig-tree of the open country near the forest," *D. E. Hutchins ;* Barberton, July, 1906, *Davy*, 3489, 3490. I have also collected it at Nelspruit, Sabie Valley (below Sabie-hoek forest at 4,000 ft. alt.), Tzaneen and near Pietersburg. It is not the "Mooo'mo" of the Modjajies, as stated in my list through a misconception of the species.

Ficus caffra, *Miq.*—Macaliesberg, Nov., a "tree", *Burke* (type) ; *Zeyher*, 1548 ; in the Kew herbarium the labels of Zeyher's specimens, 1548 and 1549 have evidently been transposed, the label "1549 *Ficus* (Urostigma) *abutifolium*, Miq." being attached to a specimen of *F. caffra* and "1548 *Urostigma xanthophyllum*, Miq." to *F. soldanella*, Warb. (*i.e. F. abutilifolia*, Miq.?). Wonderboompoort, *Rehmann*, 4434 ; Lydenburg district, "bei Stephanus Schoeman's farm," Oct. 1887, *Wilms*, 1348 ; Houtbosch *Rehmann*, 6490 ; Zoutpansberg, Sept. 5, 1905, "Edordse", *D. E. Hutchins*, 17 (with very large fruits, 6 lines diameter ; perhaps distinct) ; Blaauwbank, "shrub," *Nelson*, 267. Specimens from the following localities are cited by Warburg :—Lydenburg district, between Spitzkop and Komatie River, *Wilms*, in herb. Zurich ; Wonderboompoort, Kuduspoort ("hugel beim Aapjies River")

and Houtbosch. According to Warburg, typical *F. caffra* is confined to the Transvaal, but there are named varieties in Cape Colony, Natal, and Zambesia.

Var. **longipes**, *Warb.*—*See* note under *F. cordata*, below.

Ficus cordata, *Thunb.*—The Pretoria "Wonderboom" was at one time identified for me at Kew as this species, and I have since called it by that name (see *Transvaal Agricultural Journal* v. 4 n. 13, plates 3, 4 and 5. Oct. 1905). Although I have not been able to see Thunberg's type, his published woodcut of it, and the material so named at Kew, show that *F. cordata* is distinct from any species known to us in the Transvaal. It is largely, if not entirely, a coast region species. Warburg, in his revision of the South African species of *Ficus* ("Die Sudafrikanischen Arten d. Gatt. *Ficus*" in *Beitr. z. Kennt, d. Afrik. Fl.* xviii, in *Mitt. a.d. Bot. Mus. d. Univ. Zurich*, xxvi, published in *Vierteljahrschrift d. Naturf. Gessel. in Zurich*, Jahr. 51, Heft. 1, 1906) does not cite any Transvaal material in his account of this species, and restricts the range of distribution to Cape Colony, Bechuanaland and Hereroland; it is possible that the Bechuanaland and Hereroland trees may prove to be distinct.

Rehmann, 4435c (in herb. Zurich) from the Wonderboompoort, Pretoria, appears to me to be only an exceptionally narrow-leaved shoot of the "Wonderboom" tree, with pedicellate receptacles. At one time Warburg appears to have taken it to be a variety of *F. caffra*, for he has written on the Zurich sheet the manuscript name "*F. caffra* var. *lanceolata*, Warb."; but he finally published it as a variety of the Abyssinian *Ficus salicifolia*, Vahl., calling it var. *australis*, Warb. I have seen only one specimen of *F. salicifolia*, and that not the type, but Rehmann's specimens do not appear to bear more than a mere resemblance to it. No other South African material at Kew, Zurich, or Geneva appears to come anywhere near to *F. salicifolia*, and it seems unlikely that that species should extend its range into South Africa; in any case more material is needed before this point can be decided.

Rehmann, 4435 (in herb. Zurich) from the Wonderboompoort Pretoria, appears to me to be much the same as the "Wonderboom," but I had no specimens of the latter with me at Zurich for comparison. From the numbering and general resemblance it seems quite probable that the two specimens 4435 and 4435c came from the same tree. Warburg has, however, taken them to represent distinct species, and has called 4435 *F. caffra* var. *longipes*, Warb.

Warburg seems to have been misled by the presence or absence of peduncles to the receptacles. He has used this character in his key to separate species otherwise closely related, but it is by no means constant; some of my Wonderboom specimens have both sessile and pedunculate receptacles on the same branchlet.

Several specimens at Kew seem to connect the "Wonderboom" with *Ficus caffra*. Among these is one of Atherstone's, which bears the legend "Wonderboom near Pretoria, diam. 24 ft.—hollowed out by fire, formerly 50 feet high." Atherstone's Transvaal collections were made between Dec. 1873 and Jan. 1874.

The receptacles on herbarium material of typical *F. caffra* are larger and less depressed-globose than those on our sheets of the "Wonderboom," but I have not seen fruiting material of both, collected at the same season, with which to make a fair comparison. The "Wonderboom" forms a tree, whereas I do not recall having ever found *F. caffra* other than as a shrub (often with stout stem) climbing up the nearly vertical faces of rock outcrops on kopjies. Burke notes, however, on his label on the type of *F. caffra* from the "Macalisberg," that it is a tree. As there are no Magaliesberg specimens of Burke and Zeyher's collection with leaves as narrow as our herbarium specimens of the "Wonderboom," one is led to wonder whether their specimens of *F. caffra* may not possibly have come from that tree, or whether the latter is perhaps an undescribed species overlooked by them. It seems strange that, as they collected at the Aapjies River, the Magaliesberg, and the Crocodile River, they should have neglected to gather specimens of a tree as striking as the "Wonderboom" probably was, even 80 years ago. The resemblance to *F. caffra* of Atherstone's specimens of 1873–74 lends some colour to this suggestion, but the point can be settled only by the collection of a good series of fresh material and dissections of the receptacles. I hope to be able to do this next November, that being the month of the year when Burke and Zeyher collected *F. caffra*, and when the receptacles of the "Wonderboom" should be in the same stage of development.

Hutchins, 12, "Evergreen fig, um-Kiwan," from the Zoutpansberg, appears to be another form of the "Wonderboom."

Ficus damarensis, *Engl.* in *Bot. Jahrb.* x. (1886), p. 5.—This is near to *F. trachyphylla*, Fenzl., of N. Africa, and needs careful comparison with tropical African forms now referred to that species. The type of *F. damarensis* is *Marloth*, 1267 "juxta fontein 'Usakos' 800 m.," of which he notes "ad 15 m. alta cortice albo, frutibus esculentus." Engler also refers here *Schinz*, 2056, from Southern Angola. Species "D" No. 179 of my list appears to be this, but I have not seen Engler's type. It is one of our finest species of *Ficus*, and is a common tree in the subtropical Transvaal east of the Drakensberg. I have collected it at Barberton (*Davy*, 3488) and Tzaneen. It is readily known by its characteristic yellow bark and much buttressed trunk. The fruit is large and "edible," though usually so full of insects as to be unfit for food. Gerrard's 1632 from "Natal" appears to belong here. Specimens from Kivie Camp, Blaauwberg, Zoutpansberg (*F. C. Menne*), have the leaves much more coriaceous than those from Barberton, but in all cases under my observation they become unusually brittle in drying.

Ficus Dinteri, *Warb.*—Hereroland (type). My 5218 from the Zoutpansberg appears to belong here.

Ficus Durbanii, *Warb.*—Natal, Oakfort, Umhloti river, *Rehmann*, 7476 (type). Warburg tentatively assigns Rehmann's 4431 and 4437 from the Wonderboompoort to this species, but admits uncertainty as the specimens are sterile. It is possible that they belong to *F. Burkei*, typical material of which does not appear to

have been re-collected since Burke's day. I am not yet quite clear as to the specific points of difference between *F. Burkei*, *F. Galpinii*, *F. Durbanii*, and *F. Schinziana*.

Ficus Galpinii, *Warb.*—Barberton, 10,000 ft., "tree 15–20 ft. high," June to July 1889, *Galpin*, 397 (type); between Spitzkop and Komatie River, Lydenburg District, Aug. 1884, *Wilms*, 1345, fide Warburg.

Ficus natalensis, *Hochst.*—No Transvaal specimens at Kew or Zurich appear to belong here. Warburg notes that Rehmann's 6493 from the Houtbosch may be this, but as it is a sterile specimen he is uncertain of its identity. It seems more likely that it is one of the three species *F. Burkei*, *F. Schinziana*, or *F. Galpinii*, rather than *F. natalensis*, which appears to be more coastal in its range, extending southwards into Cape Colony, but apparently not known to occur in the interior.

Ficus Schinziana, *Warb.*—Houtbosch, *Rehmann*, 6491 (type). Warburg notes that this is related to *F. natalensis* and *F. Dinteri*. This may be No. 175 of my list, which is common in the Houtboschberg forests, often saprophytic on other trees, which it finally smothers.

Ficus soldanella, *Warb.* (No. 177, species "B" of my list).—Macaliesberg, Jan., *Burke*, 273; *Zeyher*, 1549; Kuduspoort, Pretoria, *Rehmann*, 4684 (type). *Zeyher*, 1549 is included by Miquel in his *F. abutilifolium*, of which ours may perhaps be only a geographical variety.

Ficus Sonderi, *Miq.* (1867) (*Sycamorus hirsuta*, Sonder in *Linnaea*, xxiii. (1855), 137; not *Ficus hirsuta* of Vell., nor of Hook., nor of Roxb.; *F. Rehmanni*, Warb. l.c. No. 178, species "C" of my list).—Sonder's type is *Gueinzius*, 415, from "Port Natal," while Warburg's type is *Rehmann*, 6486, from the Houtbosch, Transvaal. Warburg has completely overlooked Miquel's name, perhaps because the *Index Kewensis* erroneously gives the distribution of this species as "Malaya"; examination of Kew material would have cleared up this and other doubtful points about the South African species.

The following belong here:—Transvaal: Houtbosch, *Rehmann*, 6486; Zoutpansberg, *D. E. Hutchins*, 15; Roodepoort, Warm Baths, *Bolus*, 12300; Natal: *Gerrard*, 1577; Intschanga, *Rehmann*, 7900; Inanda, *J. M. Wood*, 1361; Bechuanaland, *Baines*. I have also collected it at Barberton and Nylstroom.

Var. **ovalifolia** (*Warb.*), *Davy*, nom. nov. (*F. Rehmanni* var. *ovalifolia*, Warb.).—Natal, Camperdown, *Rehmann*, 7711 (type).

Var. **villosa** (*Warb.*) *Davy*, nom. nov. (*F. Rehmanni* var. *villosa*, Warb.).—S. Rhodesia, *Marloth* (type); Transvaal, between White River and Nelspruit, among rocks, Jan. 25th, 1906, *Davy*, 5219; Bechuanaland, um-Zingwani Valley and Pelicosi (Makalaka), granite kopjies, "tree 20 ft. high, milky juice", *Baines*.

Ficus sp. nov. (No. 176, species "A" of my list).—Nelspruit, *Davy*. This appears to be undescribed, and is very near to a species collected by Dr. Kirk at Champenga, Zambesia, "the large

tree near the house," but in the latter the leaves are rather broader. I have not compared it with Warburg's illustrations of the Congo species.

Ficus "sp. F." (No. 181 of my list).—My Koomatiepoort specimen was not sent for comparison, but it may match Gerrard's 1631 from Natal or Zululand, which agrees with specimens from "near Merambella," Zambesia, *Kirk*, and "Island in the Shiré below M'bewe, bark smooth, whitish, . . . 15 to 20 ft.", *L. Scott*, which have been referred tentatively to *F. antithetophylla*, Steud. (*F. capraefolia*, Delile.)

MYRTACEAE.

The anomalous genus *Heteropyxis* has now been transferred from *Lythraceae* to *Myrtaceae* (see *Bull. Herb. Boiss.* v. 4, p. 439).

Heteropyxis canescens, *Oliv.* in *Ic. Pl.* v. 25, t. 2407, Nov. 1895 (syn. *H. transvaalensis*, Schinz in *Bull. Herb. Boiss.* v. 4, p. 439, June 1896).—Barberton, Reimer's Creek, 3,000–4,000 ft., Sept. 1889, tree 25 ft., *Galpin*, 518 (type of both of the above names). A small, slender-stemmed, crooked tree with white bark, making it very conspicuous among the other trees and shrubs among which it grows. Foliage drooping, leaves emitting a strong, camphor-like odour when crushed.

Heteropyxis natalensis, *Harv.*—Mountains, Dorum River, Cave Mts., "shrub," *Nelson*, 406; Barberton, Reimer's Creek, 2,800 ft., tree 15 ft., fls. Feb. 1891, *Galpin*, 1295; Shilouvane, Colline, March, shrub 1–3 m., *Junod*, 1423; Vallon du Masetane, 2–4 m., *Junod*, 1090; Botsabelo, Miq., Middelburg District, in saxos pr., 1,630 m., *Schlechter*, 4098; Warm Baths, *Davy*. Also in Nyasaland and Natal.

OLACACEAE.

Ximenia caffra var. **natalensis**, *Sond.*—Barberton, lower hillslopes, 2,000–2,800 ft., fl. Nov. 1889, shrubs 8–10 ft., fruit scarlet, edible, Kaffir name "Matindeluka," *Galpin*, 736. Barberton, Kaap River Valley, 2,000–2,800 ft., shrub 8 ft., fruit plum-colour, edible, *Galpin*, 1105, Sept. 1890. Natal: Kaffir name "um-Tunduluka," *J. M. Wood*, in herb. Kew.

OLEACEAE.

Olea foveolata, *E. Mey.*—Transvaal, Masetane River, near Shilouvane, Zoutpansberg, shrub 2–3 m., *Junod*, 1266. Also in Natal, the Transkei, &c. Leaves broader than in typical *O. laurifolia*.

Olea laurifolia, *Lam.* Black Ironwood.—No Transvaal material at Kew.

Olea (**MacKenii**, *Harv.?*).—Houtboschberg, Aug. 31st, 1905. *A. P. Grenfell* (T.D.A. herb. 1026); material incomplete.

Olea verrucosa, *Link.*—Macaliesberg, *Burke* s.n. Streydpoort, Makansberg, *Rehmann*, 5395 ; Houtbosch, *Rehmann*, 6476 ; Pretoria, Aapjiespoort, *Rehmann*, 4052 (rusty tomentose beneath). Also in Natal, Griqualand West, Graaf Reinet, Kaffraria, Somerset Paarl, Albany, Queenstown, Uitenhage, and Devil's Mt., Cape Town. On a label on a Cape Colony specimen (*Dr. Thom*, 751) is noted, "snuff made of the leaves employed to cure bleeding at the nose."

Olea Woodiana, *Knobl.*, in *Bot. Jahrb.* xvii. (1893) 532.—A Natal species, not taken up in the *Flora Capensis* and of which I have seen neither specimens nor description. There is at Kew a very large-leaved species from the Boschberg, Somerset Division, Cape Colony (*Burchell*, 3221), also found in the George and Knysna Divisions, which reminds me of a common tree of the Houtboschberg forests. We need flowering specimens for determination.

Schrebera argyrotricha, *Gilg.* in *Engl. Bot. Jahrb.* xxx. (1900) p. 74.—Lydenburg, "beim grossen Wasserfall", Feb. 1893, *Wilms*, 201.

Schrebera Saundersiae, *Harv.* (syn. *S. latialata*, Gilg. in *Engl. Bot. Jahrb.* xxx. 1900, p. 73.)—Houtbosch, *Rehmann*, 5950, so named but may possibly be *S. argyrotricha* ; better material is needed. *S. alata*, Welw., of Angola, appears to be quite different, though united with *S. Saundersiae*, by some writers.

OLINIACEAE.

Olinia cymosa, *Thunb.*—No Transvaal material at Kew.

Olinia micrantha, *Decaisne.*—Macaliesberg, June, *Burke*, 494, fide E. Gilg. 1902 ; Graskop, near Pilgrim's Rest, upper edge of berg 4,750 ft. alt., *Davy*, 5220 ; Barberton, Upper Moodies, 4,500 ft., tree 30 ft., fls. pink, fruit pink (fls., Jan. 1891), *Galpin*, 1275 ; Elandspruit Berg, 5,500 ft., Dec. 12, 1893 (fls.), *Schlechter*, 3864 ex herb. Bolus ; Barberton, tree growing among rocks on hills 3,300 ft. alt., *Thorncroft*, 31 ; fls. "pink", S. Africa, *Zeyher*, 308.

Olinia ternata, *Gilg.*—Pretoria, Groenkloof, 4,500 ft. alt., *Davy*, 3207 (not typical).

PITTOSPORACEAE.

Pittosporum Krugeri, *Engl.* in *Notizbl. Bot. Gart. Berlin*, II. 26, Dec. 1897.—Lydenburg, "kloof bei Steph. Schoeman's Farm", Oct. 1887, *Wilms*, 213. Also in Natal.

Pittosporum viridiflorum, *Sims.*—Slang-kraal, near Crocodile River, Nov., *Burke* s.n. ; Houtbosch, *Rehmann*, 6513 ; Pretoria, colles supra Aapjies River, *Rehmann*, 4357.

PROTEACEAE.

Protea abyssinica, *Willd.*—I had not time to make any study of the Proteas at Kew, but Dr. Bolus notes that South African specimens at Kew are marked by Prof. Oliver as "probably *P. abyssinica*," and that Engler has assigned our common Transvaal Sugarbush

to that species. Rustenburg, common on slopes, forming a grove, May 24, 1903, flowers not plentiful, fragrant, visited by many ants, *Davy*, 144; Rustenburg, Aug. 1903, tree 12–15 ft. high, in groves together, *Miss A. Pegler*, 941 in herb. Bolus.

RHAMNACEAE.

Rhamnus Zeyheri, *Sond.*—The only Kew specimen is the type from the Magaliesberg.

RUBIACEAE.

The South African material of this family is badly in need of thorough revision, the following names should therefore be taken under reservation.

Adina Galpini, *Oliv.* (see *Ic. Plant.* 2386).—Shilouvane, "le long de la riviere Mooudi, arbre de 20–30 m., couleur vertjaune, Jan." *Junod*, 1431; Barberton, "tree 30–90 ft., the latter height along the river banks; Horo flats, Swaziland (2,000 ft. alt.); more stunted on Queen's River, Moodies, near Barberton (3,500 ft.) known as 'Cape Teak'; timber excellent, closely resembling teak," Jan. 1891, *Galpin*, 1213; Barberton, Nov. 1905, *P. Oranje* ("N'Hlomu") 3028; Spelonken, Nov. 16, 1906, Ceylon's Roos, "Mutulumi," *F. T. Menne*; Angola, Mossamedes, *Welwitsch*, 3028.

Adina microcephala, *Hiern.*—The Transvaal material at Kew, so named, is now referred to *A. Galpini*, Oliv.

Burchellia capensis, *R. Br.*—Transvaal, *J. H. McLea*, ex herb. Bolus, 5656; Barberton, summit of Saddleback Mt. 4,500–5,000 ft., fl. July, 1890, red, *Galpin*, 977; Swaziland, open kopjies among rocks, M'bahane, *Davy*; Natal, has a very extensive range from sea level up to 2,500 ft., *D. Sutherland*.

Cephalanthus natalensis, *Oliv.* See *Ic. Pl.* t. 1331.—Lydenburg, Waterval river, Nov. 1885 (fruit), *Wilms*, 1815; near Lydenburg, *Dr. W. G. Atherstone*, Dec. 1873, Jan. 1874 (type specimen!); Barberton, mountain sides, woody shrub 5–8 ft., fls. greenish white, fruit said to resemble a strawberry in appearance and to be edible—alt. 3,000–4,500 ft., fls. Sept. to Oct. 1889, *Galpin*, 534; Houtboschberg, 4,250–5,000 ft., border of forests, called "Matawda," *Davy*. Called "Quinine fruit" on a label at Kew.

Gardenia cornuta, *Hemsl.* in *Hook. Ic. Pl.* t. 2809.—Painting in herb. Kew, from Mrs. K. Saunders, marked "from Le Bombo, flowered at Eshowe, Dec. 1900," and named as above.

Gardenia Neuberia, *E. & Z.*—According to a note by Mr. N. E. Brown on a Kew sheet, this is synonymous with *G. Gerrardiana*, Sond. & Harv. No Transvaal material at Kew.

Gardenia Rothmannie, *L. f.*—Pretoria, Kuduspoort, *Rehmann*, 4668; Barberton, a tall tree at 4,000 ft. 16/12/03 (fls.), flowers white, *Legge*, 6 in herb. T. D. A.—agrees with Natal specimens at

Kew ; Botsabelo, Middleburg District, Transvaal, in saxos 1,600 m. 20/12/1893, *Schlechter*, 4080 ; Houtboschberg forests, *Davy* (called "Kalabash," from the size and shape of the fruits).

Gardenia Saundersiae, *N. E. Br.*—"Type raised at Tongaat, Natal, from seeds collected in the Lebombo Mts., Lourenzo Marquez, by Mr. Chas. Saunders" (in herb. Kew).

Gardenia Thunbergia, *L. f.*—No Transvaal material at Kew.

Grumilea capensis, *Sond.*—No Transvaal material at Kew. Barberton, a small tree, alt. 2,500 ft., fls. yellow, 16/12/03, *Legge*, 10, in T. D. A. herb.

Oxyanthus Gerrardi, *Sond.*—Houtbosch, *Rehmann*, 6013 ; Swaziland, Hoto concession, in woods, alt. 4,000 ft., tree 20 ft., fls. white, Dec. 1890, *Galpin*, 1262 in herb. Kew (broader leaves resembling those of *O. natalensis*, Sond.) ; Lydenburg (?), herb. T. D. A. ; Barberton, Legat, 2449A (Aug. 1904), Houtboschberg, common in dense shady forest, called "Wild Coffee," *Davy*.

Oxyanthus (latifolius, *Sond.* ?).—Sabie-hoek forest, Lydenburg District, alt. about 4,100 ft., Jan. 27, 1906, *Davy*, 5221. Fls. and fruit needed ; may perhaps prove to be *O. natalensis*, Sond.

Pavetta caffra var. **pubescens**, *Sond.*—Houtbosch, *Rehmann*, 6016.

Pavetta Cooperi, *Harv. & Sond.*—Barberton, Reimer's Creek, alt. 4,500–4,800 ft., shrub 10 ft., fls. white, scentless, Dec. 1890, *Galpin*, 1201 ; Pretoria, Aapjiespoort, *Rehmann*, 4140 (doubtfully the same) marked "= *Nelson*, 411" on sheet in herb. Kew.

Pavetta disarticulata, *Galpin.*—Barberton, "hill sides among rocks, stunted tree 4 to 6 ft., cymes and leaves on very short stems springing from gnarled old-looking branches", fls. Aug., fruit 11/1889, *Galpin*, 406 ; Swaziland near Miles Hot Springs, alt. 2,500 ft., Jan. 1905 (fls.), *Davy*, 2902 ; Zululand, *Medley Wood*, 3954A in herb. Kew.

Pavetta lanceolata, *E. & Z.*—Lydenburg, near the town of Lydenburg, Oct. 1892, *Wilms*, 600.

Pavetta microlancea, *K. Schum.*—Komatiepoort, Dec. 15, 1897, *Schlechter*, 11760.

Pavetta Schumanniana, *F. Hoffm.*—Streydpoort, Makansberg, *Rehmann*, 5459. Leaves oblanceolate, obtuse, densely grey-tomentose ; Kew sheet marked "=Welwitsch 3190!" which number is assigned by Hiern to this species ; Welwitsch collected it "in wooded thickets between Lopollo and Monino, Huilla, Angola."

Pavetta Zeyheri *Sond.*—Vaal River, May, *Burke & Zeyher*, 768 ; Pretoria District, "shrub," *Nelson*, 83 ; Pretoria, Aapiespoort, *Rehmann*, 4136, 4139 ; Pretoria, in collibus aridis prope Pretoria alt. ca. 4,500 ft., fl. Dec. 1905, *H. Bolus*, 11932.

Pavetta sp.—Pretoria, Aapiespoort, *Rehmann*, 4140, 4141; Houtbosch, *Rehmann*, 6021; Dwars River, Groot Spelonken, *Nelson*, 411.

Plectronia Gilfillani, *N. E. Br.* (ined).—Johannesburg, Jeppestown Ridge, 6,000 ft., Sept. 1889, fruit Dec. 1898, shrub 3–4 ft. high, *Galpin*, 6010 (leaves small, densely grey-tomentose, resembling those of a *Vangueria*); Pretoria, *Rehmann*, 4245 (colles supra Aapies river), 4143 (Aapiespoort), 4714 (Pretoria). ("Probably = *P. velutina*, Conrath MS. Conrath 343 seen at Kew 7/06," note by Dr. H. Bolus on Kew sheet). *P. Macleana*, Bolus MS. appears to be the same (based on *McLea*, Pretoria in collibus 4100 ped circa. Sept. 1875, ex herb. Bolus, 5655, in herb. Kew.

Plectronia Gueinzii (*Sond.*) *Szyszyl.* (*Canthium Gueinzii*, Sond.).—Barberton, 3,500 to 5,000 ft., "strong-growing climbing shrub, common in wooded ravines climbing up the highest trees, fls creamy white," Sept. 1889, *Galpin*, 519; Houtbosch, *Rehmann*, 6471; Houtboschberg, *Nelson*, 432, "in jungle, shrub H. B. B."

Plectronia mundtiana, *Pappe* (syn. *Canthium mundtianum*, Ch. & Schl.).—Pretoria, *Rehmann*, 4715; Macaliesberg, Dec., *Burke*, s.n.; Houtboschberg forests, *Davy*: The Willows, Pretoria, Nov. 12, 1904, *Davy*, 2529.

Plectronia pauciflora, *Klotzsch*.—No Transvaal material at Kew. Called "Witte Pear" in Cape Colony, *Cooper*, 1165.

Plectronia ventosa, *Hochst.* ?).—Houtboschberg forests, Zoutpansberg, alt. about 4,000–5,000 ft., *A. K. Eastwood.* (recd. Apr. 30, 1906. T. D. A. Herb. 2434). Agrees fairly well with *Burchell*, 7281, so named at Kew; Houtbosch, *Rehmann*, 6011.

Plectronia sp. nov.—Warm Baths, Jan. 1906, *Davy*, 5222; Rustenburg District ("Woodstock"), tree, 5–8 ft., masses small cream fls., Nov. 1903, *Miss Alice Pegler*, 2002, ex herb. Bolus. "Fls. very strong and objectionable scent." (*Miss K. Smith.*)

Tricalysia sp. (= *Banburya capensis*, Meissn.)—Barberton, summit Saddleback Range, fls. white, fruit scarlet, shrub, 8 ft., alt. 5,000 ft., *Galpin*, 1017 (narrow-leaved form not typical *B. capensis*; cfr. *T. Galpinii*, Schinz); Houtboschberg, *W. Nelson*, 495, intermediate form, perhaps *lanceolata* (?). Houtbosch, *Rehmann*, 6428, is the same as *Galpin*, 1017. The Galpin plant closely resembles *Baron*, 967, from Central Madagascar, labelled *Diplocrater* sp.

Tricalysia sp. (= *Kraussia lanceolata*, Sond., and *Carpothalis lanceolata*, E. Mey.).—Houtboschberg, Helpmakaar forest, 5,000 ft., *C. E. Legat* and *A. K. Eastwood*, Jan. 8, 1906. "Tol-baali", Patatabosch, Jan. 5, 1906, *Davy*. "Bark smooth, light brown, thick and corky, flaking off in chips; flowers small, solitary, white."

Trycalysia sp. (= *Kraussia pavettoides*, Harv.).—Drakensberg, Sabie-hoek forest, 4,100 ft., Jan. 27, 1906, *Davy*, 5223, may be

this; it resembles a specimen from Inanda, Natal. Placed in *Webera* at Kew. It should also be compared with *T. glabra*, Hiern.

Vangueria edulis, *Vahl.*—In fructicetis prope Potgieters Rust, alt. ca. 3,600 ft., Feb. 1904, *Bolus*, 11016. "This is an extra tropical outlier."

Vangueria euonymoides, *Schweinf.* Delagoa Bay, closely resembles *Kraussia lanceolata.*

Vangueria infausta, *Burch.*—Near Lydenburg, *Dr. Atherstone*, Dec. 1873.—Jan. 1874; Kalahari, *Burchell* (Klipfontein), frutex 5–10 pedalis; Delagoa Bay, *Forbes*; Natal, Bashee River, Fort Bowker, "on the skirtings of forests and kloofs." "Fruit ripens in Autumn; an excellent fruit tree—the fruit of this tree surpasses that of the English medlar," *M. E. Bowker*; Macalisberg, Nov., *Burke*, 250; in collibus circa Pretoria, *J. H. McLea.*

Vangueria latifolia, *Sond.*—All Transvaal material at Kew appears to be referred to *V. infausta.*

Vangueria longipes, *Conrath* MS. (type *Conrath*, 343).—Jeppestown Ridge, Johannesburg, about 6,000 ft., Dec. 1898, *D. F. Gilfillan*, ex herb. Galpin, 6118.

Vangueria parvifolia, *Sond.*—Crocodile River, Nov., *Burke* (lvs. small densely pubescent) type; Macaliesberg, fls. Nov., *Burke*; Johannesburg, ridges above Jeppestown alt. 6,000 ft., Oct. 1898, frts. Dec., *D. F. Gilfillan*, ex herb. Galpin, 6012; Pretoria, Aapiespoort, *Rehmann*, 4142; colles supra Aapies River, *Rehmann*, 4246.

Vangueria venosa, *Sond.*—Barberton, grassy fields, 2,800–3,000 ft., shrublet 12–24 inches high, Oct. 1890, *Galpin*, 1109.

SANTALACEAE.

Colpoon compressum, *Berg., Descr. Pl. Cap.* p. 38, t. 1, p. 1 (1767). (*Fusanus compressus*, Murray, *Syst. Veg.* ed. 13, p. 765 (1774). *Thesium colpoon*, Linn. f. *Suppl.* 161 (1781); Thunb. *Prod.* 46 (1794); and *Fl. Cap.* ed. Schultes, p. 211. *Euonymus colpoon*, Lam. *Encycl.* ii. p. 574 (1786). *Osyris compressa*, A. DC. in *DC. Prod.* xiv. p. 634 (1657)).—I am indebted to a MS. note in the Kew herbarium for these synonyms. The Transvaal material at Kew, at one time assigned here, is now referred to *Osyris abyssinica*; the foliage of the one resembles that of the other very closely. I have not yet collected it in fruit and am therefore unable to say with certainty that we have *Colpoon compressum* with us. Both are said to be used for tanning; the leaves of *Colpoon compressum* are at times exported in considerable quantity from Cape Colony, under the name of "Berg-bast" or "Cape Sumach." There are the following specimens at Kew:—Camps Bay, *Burchell*, 842, 368; Simons Bay, *Grey*, *Wright*; Table Mountain, near Cape Town, *MacOwan*, in Herb. Norm. Aust. Afr. 574, *Drege.*; near Grahamstown, *MacOwan*, 43; Natal, near Murchisons, *Wood*, 3004; Eastern Districts, *Cooper*, 50 (called "Bark Bosch," used for tanning leather); Uitenhage, *Ecklon & Zeyher*, 311; Mossel Bay

Burchell, 6245; Kromme River, in Humansdorp Div., *Burchell*, 4853; Somerset Div., mountains above Commadagga, *Burchell*, 3227; Plentenberg Bay, Knysna Div., *Burchell*, 5327; near Zoetemelks River, Riversdale Div., *Burchell*, 6629; near Lowrys Pass, Stellenbosch Div., *Burchell*, 8284.

Osyris abyssinica, *Hochst.*—Pretoria, Aapiespoort, *Rehmann*, 4051; Shilouvane, *Junod*, 523; Pretoria, and near Rustenberg, *Davy*; Abyssinia, called "Keraj", teste *Schimper* in herb. Kew; Somaliland, Gabadir Plain, "a tanning plant," called "Watta" *Gen. Swayne*, ex herb. Kew; Yemen, called "Sandel Kegje", *Schweinfurth*.

SAPINDACEAE.

Pappea capensis, *Eckl & Zeyher*.—This is quite different from our Transvaal tree and there is no Transvaal material of *P. capensis* at Kew; *Wilms*, 206, so labelled, is *Antidesma venosum*. The leaf of ours is much more like that of *P. Radlkoferi*, Schweinf., but smaller, it may be *P. Schumanniana*, Schinz (in *Verh. Bot. Ver. Brand.* xxx. 1888, 156), of which I have not seen named material. I have collected our species at East Fort and Wonderboompoort near Pretoria, and in the Bushveld of the Waterberg District near Warm Baths and Potgieter, but it is by no means a common species with us. Rehmann collected it at Streydpoort in the Makapansberg (No. 5460) and at the Aapiespoort near Pretoria (4007). Lobengula's "Judgment Tree" near Bulawayo may be this species.

SAPOTACEAE.

Sideroxylon inerme, *L.*—Pretoria, hills 4,200 ft. alt., shrub about 10 ft. high, *McLea*, in herb. Bolus, 5698. Also east of the Drakensberg.

SIMARUBACEAE.

Kirkia Wilmsii, *Engl.* in *Notizbl. Bot. Gart. Berlin*, v. 2, p. 25, Dec. 1897.—Roodepoort, Warm Baths, alt. 3,700 ft., Jan. 1906, *Davy*, 5224; Barberton, dry hillsides 2,800 to 3,000 ft. alt., tree 10 to 15 ft., Nov. 1889, *Galpin*, 691 in herb. Bolus.

UMBELLIFERAE.

Heteromorpha arborescens, *Ch. & Schl.*—There are no Transvaal specimens of typical *H. arborescens* at Kew, and ours may be an undescribed species; it appears to be distinct.

Heteromorpha glauca, *Engl.*—Lydenburg, *Wilms*, 563; Rensburg's farm near Pretoria, *Wilms*, 563b (the leaflets very narrow).

Peucedanum (fraxinifolium, *Hiern.* ?).—Barberton, tree 10 ft. high, 9 in. diameter, *Galpin*, 637; resembles the Somaliland form, so named at Kew.

URTICACEAE.

Pouzolszia hypoleuca, *Wedd.*—Appears to be a very variable species. Magaliesberg, near the Wonderboom, *Davy*, 2646;

Komatiepoort 1,000 ft., *Schlechter*, 11758. Also in Nyasaland, and there very variable. *Dr. Holub's* 1351, 1352 and 1353 from the Makalaka country seem rather different from ours.

Urera tenax, *N.E. Br.*; Urera fibre tree.—Rustenberg District, plentiful in stony ground on the hills on farms Welgevonden, 159 and Doornkloof, 624, near the junction of the Pienaars and Crocodile Rivers, *W. R. Lanham* (in T. D. A. herb.).

HERBACEOUS PLANTS AND SUB-SHRUBS.

Alysicarpus vaginalis, *DC.*—Pigg's Peak, Swaziland, May, 1906, *Dr. Penny*, in T. D. A. herb. 2388, supposed to have been used in a case of criminal poisoning, but there is no note on any of the numerous specimens at Kew that it is poisonous. The flowers are described as "blue" on a specimen from Nupe, Niger, collected by Barter, who notes that it is "a pest in some cultivated soils." Collectors often note that it grows in or near cultivated ground or villages. Apparently an exceedingly variable species as regards habit and leaf outline.

Nidorella hottentotica, *DC.*—Prope Pretoria in campis, 4,000 ft., Sept. 1875, *J. H. McLea*, ex herb. Bolus, 3115; Blaauwbank, *Nelson*, s.n., Aug. 1880; Pretoria, Meintjes Kop, *Davy*, 6; a common and untidy weed.

Nidorella resedaefolia, *DC.*—Becoming increasingly abundant as a weed in cultivated ground, near Christiana 4,100 ft., *Davy*, 1611; near Nylstroom 3,500 ft., *Davy*, 2111; Willow Park, Zeerust, *Davy*, 92.

Phyllanthus parvulus, *Sond.*—Aapjies River, *Zeyher*, 1508 (type); *Burke*, Oct.

Phyllanthus glaucophyllus, *Sond.*—Macaliesberg, Nov., *Burke*; *Zeyher*, 1509 (type).

Phyllanthus genistoides, *Sond.*—Macaliesberg and Aapjies River, Oct., *Zeyher* (type).

Phyllanthus tenellus, *Muell.*—Vaal River fields, *Nelson*. s.n.

Phyllanthus Niruri, *L.*—Barberton, hillsides 3,000 ft., Sept. 1889, *Galpin*, 566; "Transvaal," *Sanderson*; Bushveld, Klippan, *Rehmann*, 5337.

XXII.—PLANT IMPORTATION INTO JAMAICA.

From the Proclamation issued by the Governor of Jamaica, which is printed below, it will be seen that the prohibition against the importation of plants, seeds, &c., into Jamaica from the Old World has now been withdrawn, but the imported plants and seeds must be fumigated in accordance with the published instructions.

The following papers on this subject have been received through the Colonial Office :—

COLONIAL OFFICE to ROYAL BOTANIC GARDENS, KEW.

Downing Street,
3rd January, 1908.

SIR,

WITH reference to the letter from this Department of the 20th February, 1888, I am directed by the Earl of Elgin to transmit to you for your information the enclosed copy of a despatch from the Governor of Jamaica on the subject of the importation into the Colony of plants, seeds, &c., from certain portions of the British Empire.

I am, etc.,
(Signed) C. P. LUCAS.

The Director of the Royal Gardens, Kew.

The GOVERNOR of JAMAICA to COLONIAL OFFICE.

King's House, Jamaica,
11th December, 1907.

MY LORD,

WITH reference to Sir H. W. Norman's despatch No. 445, of the 23rd December, 1887, I have the honour to inform your Lordship that, under the power given by "The Seeds and Plants Importation Law, 1884," I have by Proclamation revoked the proclamation of 2nd December, 1887, prohibiting the importation into this island of seeds or plants or any description of earth or soil or any article packed therewith that may have come either directly or indirectly from Natal, South India, Ceylon, Mauritius, Java and Fiji, and have in the same Proclamation (two copies of which are annexed) prescribed the conditions under which alone the importation of any of the articles specified shall be permitted that may have come from any of the countries mentioned.

2. I have taken this action on the recommendation of the Director of Public Gardens and Plantations, the Board of Agriculture, the Jamaica Agricultural Society, and the Commissioner of Agriculture for the West Indies, and shall be glad if your Lordship will be so good as to cause the Director of the Royal Gardens, Kew, to be informed of it.

The immediate cause was a representation from Mr. Fawcett that as the last consignment of Para Rubber was not quite successful, planters were asking that the Proclamation against Ceylon and other places might be withdrawn, and Mr. Fawcett added that he had consulted the owners of the most important of the Blue Mountain Coffee estates and that they agreed that there would be no danger now to our coffee of infection with *Hemileia vastatrix*.

I have, etc.,
(Signed) SYDNEY OLIVIER,
Governor.

The Right Honourable
The Earl of Elgin, K.G., etc., etc.

(ENCLOSURE.)

(Signed) SYDNEY OLIVIER.

By His Excellency Sir Sydney Olivier, Bachelor of Arts, Knight Commander of the Most Distinguished Order of
(L.S.) Saint Michael and Saint George, Captain-General and Governor-in-Chief in and over the Island of Jamaica and its Dependencies.

A PROCLAMATION.

WHEREAS it is enacted by the First Section of Law 4 of 1884,—"The Seeds and Plants Importation Law, 1884"—that it shall be lawful for the Governor to revoke or vary any Proclamation made by him under that section;

AND WHEREAS General Sir Henry Wylie Norman, G.C.B., G.C.M.G., C.I.E., Captain General and Governor-in-Chief in and over the Island of Jamaica and its Dependencies, by Proclamation made on the 2nd day of December, 1887, prohibited until further Proclamation the importation into this Island of seeds or plants or any description of earth or soil or any article packed therewith that may have come either directly or indirectly from any of the following countries, viz.: Natal, South India, Ceylon, Mauritius, Java and Fiji.

NOW, therefore, I, the Governor, do hereby revoke the aforementioned Proclamation bearing date the 2nd day of December, 1887, and I hereby proclaim that I prescribe the following conditions as conditions under which alone the importation of any of the articles aforesaid shall be permitted that may have come either directly or indirectly from any of the countries aforesaid, viz.: That all such articles (including seeds) imported from the aforementioned countries shall be fumigated in accordance with the instructions published in the *Jamaica Gazette* of the 9th January, 1902.

Given under my hand and the Broad Seal of this Island at Head Quarters House, Kingston, on the eleventh day of December in the seventh year of His Majesty's reign Annoque Domini 1907.

By Command,

(Signed) H. CLARENCE BOURNE,
Colonial Secretary.

(EXTRACT from the *Jamaica Gazette*, January 9, 1902.)

Instructions for the Guidance of Officers of the Government Laboratory and Kingston Customs in regard to the manner in which imported Plants, Cuttings, &c., and their coverings shall be dealt with.

Immediately on the landing of any plants, cuttings or other articles, specified in the Governor's Proclamation of the 7th September, 1901, published in the Government Notice No. 278, of the 10th of that month, in the *Jamaica Gazette*, they shall be taken charge of by the Customs Officer, who will give the Wharfinger, or other party concerned, a receipt therefor, showing the time and date of delivery.

The Customs Officer shall at once notify the Government Chemist, in writing, of the articles to be fumigated, stating the approximate dimensions thereof and obtain his instructions as to the time at, and place to, which they are to be forwarded for fumigation.

The Customs Officer will then forward the articles accordingly in charge of a Customs Escort, who will remain in attendance during the process of fumigation and afford, or provide such assistance and labour as the Government Chemist or his officer in charge may require.

Immediately on receipt of the Articles the Government Chemist (or his Assistant) shall cause them to be fumigated in the manner and under the conditions prescribed by the Governor in Privy Council.

So soon as this has been done, and a memorandum showing the time of receipt and delivery furnished to the Customs Escort, the Articles shall be taken charge of by the Escort and conveyed to the King's Warehouse or other place, as arranged by the Landing Waiter.

The greatest care must be taken by the Officer in charge of the King's Warehouse to keep plants, cuttings, &c., alive and in good condition.

All expenses of removing the articles to the Government Laboratory, and thence to the King's Warehouse, with any expenses necessarily incurred in keeping the articles in good condition, shall be met by the Importer, all such amounts being brought to account as King's Warehouse Fees as provided by the Customs Regulations on the subject.

Plants, cuttings, &c., should not be forwarded to the King's Warehouse in cases where Importers defray expenses of removal, labour, &c. (if any) at once, and at the same time arrange with the Customs Officer to take delivery of the articles immediately after fumigation. This provision will refer more particularly to the plants, &c., brought by passengers and imported through the parcel post, &c.

Officers of Customs and of the Laboratory are required to exercise strict economy in arranging for the transport of the plants, &c., and other expenses, so that the charge to the Importers may be as small as possible.

XXIII.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS XLIX.

925 481. **Sterculia (Eusterculia) Henryi,** *Hemsl.* [Sterculiaceae—Sterculieae] ; *S. coccineae*, Roxb., proxima, a qua differt floribus majoribus vere racemosis et pedunculis pedicellisque minus gracilibus.

Frutex 3-pedalis, novellis ferrugineo-puberulis. *Rami florigeri* teretes. *Folia* ad ramorum apices conferta, petiolata, papyracea, oblonga vel lanceolato-oblonga, absque petiolo 15–25 cm. longa, 4–6 cm. lata, basi rotundata, apice acuminata, integra, glabra ; venae subtus conspicuae, primariae utrinque circiter 15, curvatae, paullo intra marginem anastomosantes ; petioli teretes, 2·5–5 cm. longi. *Flores* unisexuales vel polygami, rubescentes, racemosi ; racemi numerosi, in foliorum axillis vel interdum ad apices ramorum defoliatorum in axillis bractearum conferti, 5–15 cm. longi. ferrugineo-pilosuli, pilis stellatis, graciles, suberecti ; bracteae lineari-lanceolatae, pedicellos aequantes, acutae, cito deciduae ; pedicelli 0·5–1 cm. longi. *Calycis segmenta* fere ad basin libera, ferrugineo-puberula, anguste lanceolata, 1·75–2 cm. longa, infra medium circiter 4 mm. lata. *Stamina* 10 ; columna glabra, circita 4 mm. longa, recurva. *Pistillum* hirsutum, cum columna glabra 6–7 mm. longum ; stylus hirsutus, recurvus ; antherae cassae, ovario arcte appressae. *Fructus* ignotus.

China. Yunnan ; mountain forests S.E. of Mengtze at about 1,500 m., *A. Henry*, 11016.

1913 482. **Sterculia (Eusterculia) scandens,** *Hemsl.* [Sterculiaceae-Sterculieae] ; species ex affinitate *S. nobilis*, R. Br. et *S. Balanghas*, Linn., sed ab utraque foliis majoribus venis primariis lateralibus numerosioribus, floribus majoribus et calycis tubo brevi differt.

Frutex scandens, praeter inflorescentiam glaber vel cito glabrescens, ramis florigeris rectis crassis glabrescentibus sulcatis. *Folia* simplicia, papyracea, petiolata, oblonga vel lanceolata, absque petiolo 15–40 cm. longa, 12–15 cm. lata, interdum nonnulla superiora 8–10 cm. tantum longa, basi rotundata, acuminata, integra ; costa crassa, utrinque, praecipue subtus, elevata ; venae primariae conspicuae, in foliis majoribus utrinque, 17–20, curvatae, juxta marginem inter se conjunctae ; petioli teretes, basi apiceque leviter incrassati, usque ad 12 cm. longi, sed saepius breviores. *Flores masculi* rosei, pilosi, pilis stellatis, circiter 2 cm. diametro, in foliorum superiorum axillis paniculati ; paniculae angustae, graciles, erectae, 10–20 cm. longae, bracteis nullis vel citissimo decidius, sed interdum foliis paucis 4–5 cm. longis instructae ; pedicelli filiformes, floribus breviores. *Calycis segmenta* e basi lata lineari-lanceolata, 2–2·5 cm. longa, acuminatissima, arcuata, apice cohaerentia. *Stamina* 10 ; columna brevis, gracilis, recurva, antheris deorsum spectantibus. *Flores feminei* carent.

TONKING. Laokai, *E. H. Wilson*, 2796 ; *A. Henry*, 13643, collected by Mr. Wilson.

483. **Euonymus Balansae,** *Sprague* [Celastraceae] ; affinis *E. subsessili*, Sprague, a quo ramulis tuberculatis, petiolis longioribus, fructibus majoribus longiaculeatis recedit.

Frutex glaber, ramis gracilibus pendulis (teste *Balansa*), ramulis gracilibus quadrangularibus dense minute tuberculatis. *Folia* lanceolata, basi cuneata, apice acute acuminata, 5–10 cm. longa, 2–4 cm. lata, serrulata, tenuiter coriacea, in sicco griseo-viridia, subconcolora, basi subtriplinervia, nervis lateralibus utrinque 6–7 patulis satis intra marginem anastomosantibus supra in foliis junioribus manifestis in vetustis inconspicuis subtus prominulis ; petioli 4–6 mm. longi. *Gemmae* ovoideae, circiter 5 mm. longae, purpureo-brunneae, perulis ciliolatis. *Dichasium* quater furcatum, pedunculo sub fructu circiter 1·3 cm. longo. *Flores* ignoti. *Capsula* brunnea, circiter 1·7 cm. diametro, aculeis inclusis ; aculei subulati, inferne ± compressi, 3–4 mm. longi. *Semina* in arillo omnino inclusa.

TONKIN. On calcareous rocks at Dong-Dang, *Balansa*, 1451.

484. **Euonymus Wilsonii,** *Sprague* [Celastraceae] ; affinis *E. actinocarpo*, Loes., a quo petiolis subtriplo longioribus, foliis majoribus laxius serrulatis pro rata angustioribus recedit.

Frutex sempervirens, scandens, glaber, ramis cinereis, ramulis gracilibus pallide viridibus paullulo costatis. *Folia* lanceolata, basi cuneata, apice longiuscule acuminata, 8–15 cm. longa, 2–4 cm. lata, laxiuscule serrulata, tenuiter coriacea tantum, discolora, basi triplinervia, nervis ceteris lateralibus utrinque 5–8 patulis vel obliquis satis intra marginem arcuatim connexis supra vix impressis subtus prominentibus vel prominulis ; petioli graciles, 1–1·5 cm. longi. *Pedunculi* 2–4 cm., sub fructu usque ad 5·5 cm. longi, anguste alati. *Dichasia* ter vel quater furcata. *Pedicelli* 4–5 mm. longi. *Flores* masculi (functione) tantum cogniti, 8–8·5 mm. diametro. *Calyx* 3·5–4 mm. diametro sparse glanduloso-ciliolatus. *Petala* suborbicularia, vix ultra 3 mm. diametro. *Discus* 2·5 mm. diametro. *Filamenta* triangulari-subulata, 0·4–0·5 mm. longa ; antherae 0·4–0·5 mm. longae, circiter 0·8 mm. latae, lobis suborbicularibus. *Ovarium* 4-loculare, obtuse tetragonum, prominulum, minute papillosum, styli brevissimi obtusissimi apice vix ultra 0·5 mm. supra discum elevato, ovulis pro loculo binis collateralibus descendentibus. *Capsula* fulva, leviter depressa, 2 cm. diametro vel paullo ultra, aculeis inclusis ; aculei subulati, ± compressi, 4–6 mm. longi. *Semina* in arillo omnino inclusa, circiter 1 cm. longa (nuda 8 mm. longa).

WESTERN CHINA. Mt. Omi, *Wilson*, 4788 ; without precise locality, *Wilson*, 3330.

485. **Boea lanata,** *Hemsl.* [Cyrtandraceae] ; inter species melanesias hucusque cognitas foliis ovatis petiolatis densissime sericeo-lanatis et cymis multifloris distincta.

Herba perennis, subscaposa, vix pedalis. *Folia* pauca, conferta, petiolata, crassa, late ovata, absque petiolo 4–8 cm. longa, obtusa,

basi rotundata vel subcordata, obscurissime denticulata, utrinque densissime appresso-lanata, mollissima, supra argentea, subtus fulva, venis primariis lateralibus utrinque circiter 7, subtus sat conspicuis ; petioli crassi, fulvo-lanati, 2–3·5 cm. longi. *Flores* parvi, in cymas densas compositas pedunculatas circiter 15 cm. diametro dispositi. *Inflorescentia* omnino piloso-hirsata. *Bracteae* angustae, quam flores breviores. *Calyx* dense albo-pilosus ; segmenta lanceolata, 6–7 mm. longa, acuta, erecta. *Corolla* sub-bilabiata, circiter 1 cm. longa. *Stamina* 2 ; filamenta brevia, carnosa, dolabriformia ; antherae magnae, arcte conniventes. *Ovarium* pubescens. *Capsula* linearis, matura ignota.

SOLOMON ISLANDS. Florida, growing on rocks, *C. M. Woodford.*

1897 486. **Pogostemon (Paniculata) Griffithii,** *Prain* [Labiatae-Satureineae] ; species distincta foliis eis *P. elsholtzioidis*, Benth., simillimis sed floribus potius *P. Heyneano*, Benth., affinis.

Herba erecta, ramosa, ·5–1 m. alta. *Caules* ramique graciles, obscure 4-goni, appresse puberuli vel pubescentes. *Folia* ramisque opposita, decussata, membranacea, ovato = vel oblongo-lanceolata, apice acuminata, basi cuneata, margine basi integro excepto serrata, utrinque sed praesertim subtus secus nervos parce subappresse pubescentia, 10 cm. longa, 2·5–3 cm. lata ; petioli 1 cm. longi, appresse puberuli. *Verticillastri* in spicis simplicibus 2–6 cm. longis 8 mm. latis caules ramosque terminantibus aggregati, inferiores internodiis 5 mm. longis remoti, superiores approximati. *Calyx* anguste campanulatus, 4 mm. longus, extra parce pubescens, lobis 5 anguste triangulis aequalibus tubo duplo brevioribus. *Corolla* carnea, 7 mm. longa lobo antico ceteris parum majore, glabra. *Filamenta* subadscendentia, barbata. *Styli* rami subaequales, 2·5 mm. longi. *Nuculae* ovoideae, glabrae.

BURMA. Hukung Valley, between Keouk Seik and the Serpentine Mines, 100–150 m., *Griffith*, 3962 [K.D.]

This species, though very different in respect of inflorescence, bears, as regards leaves, a close resemblance to *P. elsholtzioides*, and was distributed under that name, with the number quoted above, in 1862–3.

5-268 487. **Rheum globulosum,** *Gage* [Polygonaceae-Rumiceae] ; species nana, in grege *Desertícolarum* cl. Maximowiczio proposito ponenda, a caeteris tamen hujus gregis statura minima, habitu 1–foliato, inflorescentia globoso-capitata magnopere differt.

Herba nana, acaulis, glabra, vix 7 cm. alta. *Rhizoma* incrassatum, breve, repens, collo 6 mm. diametro, stipularum scariosarum brunnearum reliquiis dense vestito. *Folium* solitarium, petiolatum e rhizomatis apice cum pedunculo evolutum ; lamina reniformis vel reniformi-orbicularis, basi cordata vel sinuata, apice obtusa vel subacuta, margine integra vel obscure lobata, coriacea, pallide viridis, utrinque sed praesertim supra corrugata, 1·2–2 cm. longa, 2–3 cm. lata ; petiolus 2 cm. longus, in faciem laminae inferiorem radiatim in nervis latis regulariter iterum bifurcatis productus. *Inflorescentia* simplex, globoso-capituliformis ; capitulum 1·2–2 cm. diametro ; pedunculus 3·8–5 cm. longus, terminalis. *Flores* breviter pedicellati, 6 mm. longi. *Perianthii*

segmenta saepissime 6, exteriora 2 caeteris majora, marginibus alba, centro viridia, linea centrali in tuberculo minimo dorsali prope apicem segmenti terminante. *Stamina* 8–9, subaequalia, perianthii segmentis aequilonga. *Ovarium* 3-quetrum ; styli 3, brevissimi ; stigmata capitata. *Fructus*, vix maturus, 3-alatus.

TIBET. Khamba ; near Khambajong, 4650 m., *Younghusband*, 92.

This striking little species was collected by Col. Sir F. E. Younghusband, on behalf of the Royal Botanic Garden, Calcutta, during the earlier phase of the Tibet Mission.

5.764 488. **Rheum laciniatum,** *Prain* [Polygonaceae - Rumiceae] ; species elata, in grege *Monticolarum* cl. Maximowiczio proposito ponenda, certissime *R. officinali*, Baill., et *R. palmato*, Linn., proxima, foliis tamen intricate dissectis ab ambobus facillime distinguenda.

Herba elata, caule folioso. *Folia* membranacea, pallide viridia, utrinque sed praesertim subtus plus minusve scabriuscula, palmatim segmentis irregulariter 1–2-pinnatim divisis 5-secta, ambitu oblongo-ovata, majora 36 cm. longa, 24 cm. lata ; segmenta basalia lateralibus dimidio, lateralia centrali iterum fere dimidio breviora, laminis omnium in pterygomata angusta subconformia secus nervos expansa reductis ; basalia 10 cm. longa, 8 cm. lata, lobis 3–4-jugis majoribus 4 cm. longis 2 cm. latis, laciniis majoribus ·75 cm. longis ·25 cm. latis ; lateralia 20 cm. longa, 16 cm. lata, lobis 8–10-jugis majoribus 8 cm. longis 7 cm., latis, laciniis majoribus 4 cm. longis ·75 cm. latis ; segmentum centrale 36 cm. longum, 20 cm. latum, lobis 12–15-jugis majoribus 15 cm. longis 8 cm. latis, laciniis majoribus 6 cm. longis 1·5 cm. latis ; pterygomata ·45–·75 cm. lata ; petiolus 12–15 cm. longus, semi-cylindricus, scabriusculus ; ocrea 7 cm. longa, membranacea, extra scabriuscula. *Inflorescentia* paniculata, pyramidalis, ultra 40 cm. longa, rhachide ramisque primum parce scabriusculis, demum glabrescentibus. *Flores* parvuli, breviter pedicellati. *Perianthii segmenta* saepissime 6, subaequalia, herbacea, pallide viridia, apicibus conniventia. *Stamina* 8–9, aequalia, perianthii segmentis dimidio breviora. *Ovarium* 3-lobum ; styli 3, distincti, recurvi ; stigmata capitata. *Fructus* ignotus.

CHINA. Szechuen, in ravines, 3300 m., *Wilson*, 4415.

Mr. E. H. Wilson, who collected this species on behalf of Messrs. J. Veitch & Sons, in ravines, at 10,000 ft., in Western China, states that it is rare.

18960 489. **Asplenium bireme,** *C. H. Wright* [Filices-Polypodiaceae] : *A. Wrightii*, Eaton, proximum, rhachide costaque villosis differt.

Stipites caespitosi, 30 cm. longi, castanei, sparse villosi. *Frondes* oblongo-acuminatae, apice pinnatifidae, infra simpliciter pinnatae, 45 cm. longae, 15 cm. latae ; pinnae alternae, sessiles, oblongo-acuminatae, 10 cm. longae, 1·5 cm. latae, basi inferiore rotundatae, basi superiore auriculatae, costa dense brunneo-villosa, venis uni-vel bi-furcatis. *Sori* ad furcam superiorem cujusque fasciculi venarum affixi, leviter curvati.

CHINA. Tai-mo-shan, *E. H. Wilson* and *W. J. Tutcher*.

190. **Cassebeera Woodfordii**, *C. H. Wright* [Filices-Polypodiaceae]; *C. pinnatae*, Kaulf., proxima, sed planta proceriore pinnisque sterilibus profunde inciso-serratis differt.

Caudex 1 cm. crassa, radicibus ferruginoso-tomentosis vestita. *Stipites* caespitosi, 20 cm. alti, 2 mm. diam., castanei, glabri, nitidi; lamina pinnata, deltoidea, coriacea, glabra, ad 30 cm. longa, pinnis infimis bifurcatis; rhachis stipiti similis; pinnae breviter petiolatae, lineares, acuminatae, 15–20 cm. longae, 5 mm. latae, inciso-serratae, passim segmentis linearibus 2–4 cm. longis instructae. *Sori* recti vel leviter curvati, 3–6 mm. longi.

SOLOMON ISLANDS. Tulagi, Florida Island, *C. M. Woodford.*

XXIV.—ECONOMIC NOTES: LIVERPOOL.

J. M. HILLIER.

Of the varied Vegetable Products noted in a recent visit to the City of Liverpool the following may be recorded as supplementary to those referred to in the *Kew Bulletin*, No. 2, 1907, p. 61.

MISCELLANEOUS PRODUCTS.—In the West African dock sheds several forms of Piassaba (*Raphia vinifera*) were seen, viz.: "Calabar" in cylindrical bales 5 ft. in length and weighing about $1\frac{1}{2}$ cwt. "Grand Bassa" in $3\frac{1}{2}$ ft. lengths; "Junk River" similar in appearance and staple to "Grand Bassa," but more scraggy; "Sherboro" in bundles of about $\frac{3}{4}$ cwt. and $2\frac{1}{2}$ ft. in length. generally of superior quality to the foregoing, being of finer texture, even, and better prepared; "Bereby" in 7 feet lengths securely bound with galvanised iron wire into bales of 2 cwt.

Palm Kernels in $2\frac{1}{2}$ cwt. bags from Sierra Leone and Lagos, the latter being the cleaner of the two. Pods of *Acacia arabica* in $1\frac{1}{2}$ cwt. bags, used for tanning. Large quantities of Maize from Lagos in $2\frac{1}{2}$ cwt. bags. Capsicums from the Lagos District in $2\frac{1}{2}$ cwt. bags. In commerce the larger fruits are known as Capsicums, whereas the small fruits are classified as Chillies.

Cotton Seed from Lagos in $\frac{3}{4}$ cwt. bags, and Cotton Seed Cake, a new import from the neighbourhood of Benin, consisting of trash, the Cake containing about an equal admixture of Seed and Cotton. Bales of Cotton from Lagos weighing $3\frac{3}{4}$ to 4 cwt., well banded with hoop iron, similar to the form in which Egyptian Cotton is exported. Gum Copal from Lagos of mixed quality in $1\frac{1}{2}$ cwt. bags.

"Cocoa Beans" from Lagos were in quantity, and also commercially distinguished forms from the Gold Coast and Cape Coast; the latter being exceptionally clean and carefully prepared. On the other hand some bags from Lagos consisted of trash, being full of weevils, decayed and dirty.

Copra, the dried kernel of the Cocoa Nut, in $1\frac{1}{2}$ cwt. bags from Cape Coast. Ground Nuts in $\frac{3}{4}$ to 1 cwt. bags were observed from various ports on the coast; these were both decorticated and undecorticated. Rufisque Nuts yield the best oil, used for the manufacture of Margarine. Palm Oil from Sherboro in 15 cwt. casks.

Oil Beans in 28 lb. bags were recognised as the seeds of *Pentaclethra macrophylla*, a note upon which appeared in the *Kew Bulletin*, No. 5, 1906, p. 176. Samples of these seeds have frequently been received at the Museum from Liverpool for determination, and though enquiries for them have been made by Liverpool merchants, they do not appear to be obtainable in quantity, probably from the fact that the natives of the West Coast employ them as food.

Some putrid-looking rubber with an offensive odour ("Niger Niggers") was noted in flat bags of about 1 cwt.

Other products observed in the docks were :—Crates of Canary Bananas and boxes of Tomatoes (four to the crate) from Teneriffe; casks of Cocoa Nut Oil, each weighing about 1,500 lbs.; Red American and mixed American Wheat, being weighed into sacks of 250 lbs.; Mixed White and Yellow American Maize collected from the floor and weighed into sacks of 240 lbs. by machinery; Tomatoes (preserved in tins) from Philadelphia; oblong boxes of Californian Apples, and also an immense number of casks of American and Canadian Apples.

TIMBERS.—Of the enormous quantities of timber to be seen in the docks the following were specially noted :—Lagos Mahogany in squared logs of 12 to 20 ft.; Birch, Maple, and Cottonwood planks from Canada. Pine planks in various sizes from Canada, probably derived from *Pinus Strobus* and *P. resinosa*. Large quantities of railway sleepers, bundles of broom handles of Ash from Canada, also bundles of dowels of Poplar in several sizes from the United States and Canada. These are employed in furniture making. Shooks in bundles of 25 to 30 of Satin Walnut (*Liquidambar styraciflua*) for kegs for nails and for soft soap. Boards $\frac{1}{2}$ inch thick of American Whitewood (*Liriodendron tulipifera*) used in the manufacture of bedroom furniture. Baulks in the round, with the bark removed, of American Walnut (*Juglans nigra*) in 7 to 20 ft. lengths, painted red on the ends to prevent splitting. Canadian Rock Maple (*Acer saccharinum*) in varying lengths of 4 to 12 feet, tongued and grooved for wood flooring. American Whitewood converted for electric light casings. In addition to the above, large consignments of Canadian Rock Maple were coming in for the manufacture of mangle rollers. For this application the wood is imported shaped octagonally and is immediately stored in the dark and packed in sawdust until required for conversion. This is done to prevent checking (surface cracks). These rollers are made chiefly at Keighley and Accrington, and one firm alone will produce as many as 300,000 rollers during the course of a year.

Under the guidance of Mr. Robert Gardner and Mr. Edmund Sergeneson, of Messrs. Joseph Gardner & Sons, the well-known Hardwood Merchants of Bootle, Liverpool, a visit was made to the extensive timber yards of the firm. Of the great variety of timbers to be seen here in bulk, the following commercial varieties were specially noted :—

Caucasian Yew.—Squared in 7 to 9 ft. lengths, 1 ft. 2 ins. to 2 ft. 2 ins. in diam. at butt. This was a new import.

Walnut, Turkish.—Squared in 6 to 9 ft. lengths, 2 ft. 6 ins. in diam.

Walnut, Circassian.—Squared and of similar size to the Turkish variety. This wood was also observed in planks; it is considered superior to the Turkish wood and is of better figure.

Walnut, Italian.—In planks 10 ins. to 2 ft. 4 ins. width and 2½ to 5 ins. thick. Very defective as a rule.

Lignum Vitae, Maracaibo.—In round logs with the bark on in 5 to 12 ft. lengths, varying in diam. from 6 ins. to 2 ft. Very liable to cup-shake.

Lignum Vitae, San Domingo.—In appearance like roughly hewn railway sleepers, 12 to 18 ft. lengths, 8 to 12 ins. in thickness.

Lignum Vitae, Cuba.—In round logs up to 6 ft. One fine log was observed 3 ft. in diam.

Lignum Vitae, Jamaica.—This consisted of small wood, clean and well grown. The wood of larger size is generally too defective for use. Chiefly used for pulleys.

Lignum Vitae, Bahamas.—In short lengths of 2 to 3 ft. and 2 to 5 ins. in diam. This differs from the foregoing in being nearly all sapwood.

Ebony, Maracaibo.—In the round with bark on in 6 to 9 ft. lengths, 9 to 18 ins. in diam. Chiefly used for door knobs and finger plates.

Ebony, Macassar.—In round logs with the sap chopped off.

Ebony, Mozambique.—In small logs 2½ to 4 ft. in length, 4 to 9 ins. in diam. Very defective and of irregular shape, particularly favoured by amateur turners.

Ebony, Gaboon.—In roughly cleft billets 3 to 4 ft. in length, 2½ to 8 ins. in diam. About 45 pieces go to the ton.

Ebony, Cameroon.—Similar to the Gaboon variety in 3 to 3½ ft. lengths, 2½ to 7 ins. in diam. This ranks next to the Gaboon in commercial value. About 50 pieces go to the ton.

Ebony, Rio del Rey.—In irregular logs 2½ to 3 ft. in length, 4 to 7 ins. in diam. The wood is of good texture, but somewhat brown in colour and considered one of the inferior forms of Ebony, averaging 45 to 60 pieces to the ton.

Boxwood, Abassian.—In irregular round lengths of 3 to 3½ ft., 5 to 12 ins. in diam. In demand for engraving purposes.

Boxwood, East London.—In irregular lengths of 4 to 5 ft., 2 to 8 ins. in diam.

Boxwood, Knysna.—In the round with the bark on, in lengths of 20 ft., 4½ to 8 ins. in diam. Used chiefly for weaving shuttles.

Boxwood, Persian.—In 6 ft. lengths, 2 to 4 ins. in diam. A larger form was noted in 3 to 4 ft. lengths, 4 to 8 ins. in

diam. The small wood is used in turnery and for rollers employed in flax spinning, the larger wood being used for weaving shuttles and common engravings.

Boxwood, Turkish.—In 2 to 4 ft. lengths, varying from 1½ to 6 ins. in diam.

Boxwood, West Indian or Zapatero Wood.—In the round in 6 to 10 ft. lengths and 5½ to 12 ins. in diam. This form is almost invariably split, especially in the larger pieces.

Osage Orange or Bois d'arc.—In the round with the bark on, in lengths of 6 to 8 ft., 12 to 18 ins. in diam. Imported from the U.S.A. Used for motor spokes, golf sticks, &c.

Rosewood, Bahia.—In the round in 10 to 12 ft. lengths, varying in diam. from 7 to 18 ins. Very liable to decay in the centre.

Greenheart.—Some fine baulks of this timber were observed, about 40 ft. long. It is valued for the manufacture of fishing rods and for various other purposes on account of its strength and durability.

Degame Lancewood, Cuba.—In 14 to 16 ft. lengths, 6 to 9 ins. in diam. at the small end and about 18 ins. in diam. at base. Used for shafts and for dye sticks as the wood contains no colouring matter and resists the action of acids, &c.

Mahogany, Cuba.—In the round in 8 to 16 ft. lengths, 8 to 16 ins. in diam. This wood is more often imported squared.

Mahogany, Mexican.—In the round in 12 to 14 ft. lengths, 1 ft. 3 ins. to 2 ft. 6 ins. in diam.

Black Bark Hickory, Southern United States.—In the round with bark on, in 10 to 18 ft. lengths, 9 ins. to 2 ft. diam.

Pencil Cedar, Florida.—In roughly squared lengths of 6 to 12 ft., 8 to 15 ins. in diam.

Membrilla, Maracaibo.—In the round in 6 to 9 ft. lengths, 6 to 12 ins. in diam. Formerly used for shuttles.

Cocus Wood, Black Ebony of Jamaica, Grenadilla of Cuba, Cocoa Wood of U.S.A.—With bark on, in 3 to 6 ft. lengths, 2½ to 7 ins. in diam.

In addition to the above large quantities of Ash boat oars and Hickory hand-spikes were in stock. These are manufactured in the mills of Messrs. Gardner in the United States.

It may be noted that six or seven hundred tons of Lignum Vitae are generally kept in stock. One large pile of this wood practically ruined by the mycelium of a fungus was observed. Specimens of the injured wood communicated by Messrs. Gardner & Sons have been examined by Mr. G. Massee, and reported upon as follows :—

"The injury is caused by a fungus. The numerous cavities in the wood are filled with mycelium, which primarily passes along the medullary rays.

"The specimen was soaked for some days in water and afterwards kept at a temperature of 80°–90°. This treatment has resulted in

the production of a conidial condition of the parasite developing from the wounds in the wood. The general structure of the mycelium, its mode of attacking the wood, and the conidial form of its fruit, suggest the genus *Polyporus*, but beyond this it is impossible to go."

African Mahogany is well received in both the Liverpool and London Markets. The chief source of supply is the Lagos District, followed closely by Benin. Considerable quantities are also shipped from the Gold Coast and the Ivory Coast; that from the Gold Coast is usually of the smallest average size, generally about 50 cubic feet per log, and the product of the Ivory Coast realises the best prices, although record prices have been reached by logs from the Niger Basin.

Twenty years ago, when the West Indian and Central American Wood was imported in quantity, the West African Wood was ill received, but since the supply of the former has fallen away the consumption of the West African has extensively increased. During 1906, 21 million feet of West African Mahogany were imported into Liverpool alone. A considerable quantity of this was transhipped to the United States, where it is becoming a favourite furniture wood.

Lignum Vitae has been imported in great quantity mostly for the machine makers, as many as 3,000 pieces recently arriving in one week.

At the time of my visit a complete cargo had just come to hand of Japanese Oak and Ash, and was to be offered for public auction. The Oak was in the form of sawn sleepers, but the manufacture seems to be capable of some improvement; notwithstanding this, however, the wood was expected to be well received. It is milder and softer than the American White Oak, with the colour and working properties superior to the American Red Oak. The Ash in the form of hewn logs is very similar in make to that which the market is accustomed to from New Orleans and Baltimore. It appears to be of two varieties, one very clean and white and the other brownish. The former is the harder of the two and appears to be quite equal to the American second-growth Ash which is used by Coach-builders and Agricultural Implement Makers. The brown variety is too dark for the external work in furniture, but being soft and easy to work, should prove useful for inside linings, such as the sides and bottoms of drawers.

A parcel of logs had also just come to hand of Lapacho Wood from the Argentine Republic. There are two varieties of this wood, 'Amarillo' from a yellow-flowered variety and 'Colorado' from the variety bearing pink flowers. The 'Amarillo' is hard and dense and would find a good market here for the spokes of heavy motor wagons, for which purpose it has been tried and found to be entirely successful. It cannot, however, be imported at a price to commend its general use; it realizes, I am informed, from 4*s.* 6*d.* to 5*s.* 6*d.* per foot in Buenos Aires, at which price it would be in competition here with more familiar hardwoods of a similar nature and suitable for the same purposes.

The Argentine has also imported a quantity of Quebracho Colorado; this in its own country is in great request for sleepers,

as it is practically indestructible. It is, however, too hard and too heavy for general purposes; it is also brittle. Its chief value is for the tannin extract prepared from the wood.

North American Hardwoods are in great request principally in the form of sawn boards; in some cases these are imported ready planed to the hand of the user. Satin Walnut is in demand chiefly in the better grades, but the average width of the boards imported is seldom more than 11 inches. The sapwood and diseased trees of the Satin Walnut are imported at a very low price and sold under the name of Hazel Pine, and are principally used for cheap cabinet work and coffins. Bay Poplar or Tupelo Gum has come in in some quantity, but has met with only a poor reception.

In collecting these notes upon timbers the writer was greatly assisted by Mr. Robert Gardner, Mr. Edmund Sergeneson and Mr. James A. Weale.

Economic Collections.—In the Botanic Garden, one of the Public Institutions of the City, the following interesting group of economic plants was observed in addition to those mentioned in the Bulletin previously referred to :—

African Rubbers (*Landolphia owariensis, L. florida* and *Funtumia elastica*).

Ipecacuanha (*Psychotria Ipecacuanha*).

Sierra Leone Copal (*Copaifera Guibourtiana*).

Croton (*Croton Tiglium*).

Cola (*Cola acuminata*).

Bay Berry (*Pimenta acris*).

Avocado Pear (*Persea gratissima*).

Lignum Vitae (*Guaiacum officinale*).

Coca (*Erythroxylon Coca*).

Cinnamon (*Cinnamomum zeylanicum*).

Miraculous Berry (*Sideroxylon dulcificum*).

Oil Palm (*Elaeis guineensis*).

Tamarind (*Tamarindus indica*).

Bowstring Hemp (*Sansevieria zeylanica*).

Sugar Cane (*Saccharum officinarum*).

Para Rubber (*Hevea brasiliensis*).

Sweet Cassava (*Manihot palmata*).

Mammee Apple (*Mammea americana*).

Cherimoyer (*Anona Cherimolia*).

Mahogany (*Swietenia Mahagoni*).

Red Cinchona (*Cinchona succirubra*).

Baobab (*Adansonia digitata*).

Mango (*Mangifera indica*).

Granadilla (*Passiflora quadrangularis*) ; in fruit.

Vanilla (*Vanilla planifolia*) ; in fruit.

Under the care of Dr. Eric Drabble, F.L.S., the Museum of Economic Products at the Hartley Laboratories, Liverpool University, is developing. The bulk of the products from the Tropical Products Exhibition held in Liverpool during September last has been reserved for permanent exhibition in one of the Museums of the City.

In shops in the City the following were on sale :—Persimmons the fruits of *Diospyros Kaki*; Custard Apples (*Anona reticulata*); Avocado Pears (*Persea gratissima*); Green Corn Cobs (*Zea Mays*), Chufas, the tubers of *Cyperus esculentus*; and "South of England Mushrooms" (*Clitocybe nebularis*).

XXV.—THE TIMBERS OF SOUTHERN NIGERIA.

Mr. H. N. Thompson, Conservator of Forests, Southern Nigeria, has drawn up and sent to Kew a list of the chief timbers exported from Southern Nigeria. Descriptive notes on the gardens and plantations, together with lists (compiled by the Curators and Provincial Forest Officers) of the plants grown in them and of the economic plants of this region, have also been forwarded by Mr. Thompson.

The present article consists of Mr. Thompson's list of the timbers of Southern Nigeria, with which additional details, taken from Mr. A. H. Unwin's list of indigenous plants of economic importance, have been incorporated. In some cases Mr. Unwin's notes only supplement Mr. Thompson's account of a particular tree, whilst in others he deals with a timber not otherwise referred to.

(1.) Mahoganies of the genus *Khaya*, known to the Benis as "Gadeau" or "Ogwangu." There are three species found in these forests, viz.: *Khaya senegalensis*, R. Juss., *Khaya grandifolia*, Stapf, and *Khaya Punchii*, Stapf, the latter being apparently confined to areas that are under water for several months of the year. The timbers of these species are much in demand at home and have realized very good prices during the year. They are generally known in the trade as "Benin Mahogany."

(2.) Mahoganies of the genus *Entandophragma*, one identified species of which, viz.: *Entandophragma Candollei*, Harms, is known to the Benis as "Ikpwapobo." It is the "unscented," long capsuled mahogany and furnishes a higher percentage of "figured" logs than the other species. The timber from the tree had a bad name in the Liverpool Market, in 1904–05, as it was said to be rather "gummy," and difficult to cut into thin pieces for veneering purposes. However, since the system of girdling the trees and thus allowing them to die off gradually and become properly seasoned was adopted (on the advice of this Department) the wood has regained its good name and realised higher average prices during 1906 than *Khaya* timber.

It is most plentiful in the drainage areas of the Jamieson and Ethiope rivers of the Central Province, and is always found on high land.

The tree is usually very large, up to 50 ft. girth, very straight, and with very slight root phlanges. The value of the timber is about 3*d.* to 4*d.* per superficial foot.

(3) Mahoganies of the genus *Pseudocedrela*.—There appear to be at least two unidentified species of the genus found in Southern Nigeria. The one generally exploited is known to the Benis as "Onomokyukyu" and in the Liverpool Market as "Sapeli Mahogany." Since the "girdling" method of seasoning the timber was adopted it has been sold in Europe at very good prices. The timber is scented like Cedar and the tree has a long capsule similar to that of the *Entandophragma*. This species is perhaps most plentiful in the well-wooded valleys of the hinterland; in the moist zone it is confined to high dry ground. The timber of another species of *Pseudocedrela*, known to the Benis as "Apobo," and as "African Walnut" in the trade, is also exported to Europe.

This "African Walnut," "Anamammilla" (Benin), "Apobo" (Jekri), realises usually about 2*d.* to 3*d.* per foot. It is found all over the western part of the Central Province. The tree is of large size, up to 18 ft. in girth, and not too branching. It appears outwardly very much like mahogany at times, owing to the similar root growth. The grain is close, and of a rich walnut brown colour. Neither seeds nor seedlings have yet been seen. The tree grows on moist deep soil, and especially on southern slopes.

(4.) Timbers furnished by various species of *Guarea*, only one of which, *Guarea Thompsonii*, Sprague and Hutchinson, has so far been named. The two kinds exported to Europe are known by the Benis as "Obobonikwi" and "Obobonufwa." They have been exported to Europe under the general trade name of "Cedar Benin Mahogany." The species of *Guarea* appear to be confined to the moist evergreen forests.

Mr. Unwin writes that "Obobonufwa" (*Guarea* or *Heckeldora*) has been shipped several times and realized $2\frac{1}{2}d.$ to 4*d.* per superficial foot, and has been classified by the timber brokers as mahogany "scented." Recently not so much in demand. It is found over the larger part of the Central Province, and grows to a large size, up to 20 ft. in girth. The stem is grey in colour and pitted with indentures, where the bark peels off. Office furniture at Benin City is made entirely of this wood.

"Obobonikwi," *Heckeldora* sp. nov., worth 3*d.* to 6*d.* per foot, of late, however, it has not been fetching more than 2*d.* The wood is of a dark rich red-brown colour, of close texture, taking a good surface when planed. This tree is found over the western part of the Central Province, growing in similar localities to the mahogany, and attaining a girth of 18–20 ft. with corresponding height. It fruits readily, and the seeds germinate and develop rapidly.

All the above-mentioned plants belong to the natural order *Meliaceae*, which also includes the Honduras or true American mahoganies and cedars of the genera *Swietenia* and *Cedrela*.

The following species should also be exploited, as they have been favourably reported on by timber brokers at home.

(5.) The "Okwen" of the Benis, or *Ricinodendron africanus*, Muell. Arg., belongs to the natural order *Euphorbiaceae*. The timber has been described as that of a "species of mahogany" and declared to be suitable for the European market. It is very common in the evergreen forests of this country, but does not reach such large dimensions as some of the Khayas and Entandophragmas.

(6.) The "Ainyesan," a yellow satinwood that has fetched as much as $6\frac{1}{2}d.$ per superficial foot at Liverpool. The timber however is of uncertain quality and only picked pieces have realized that price. It is fairly plentiful in the Benin districts.

(7.) The "Ugo" of the Benis, "Atalla" of the Jekris, another unidentified species, is a good deal heavier than the Benin Wood. The seeds, when over-ripe, have the scent of phosphorus, but are not luminous. The timber is hard and close grained, of the usual red mahogany colour. It is found in the Warri and Sapeli districts chiefly, but also near Ukumo in the Benin City district, growing on a damp to wet soil. This tree attains a large size, up to 16 ft. girth, and is moderately straight. It has been reported on as a mahogany of mild texture and fairly good colour, and valued at *3d.* to *6d.* per superficial foot.

(8.) The "Nikiba," of the Benis, described as "a species of gummy mahogany," valued at from $2\frac{1}{2}d.$ to $3\frac{1}{2}d.$ per superficial foot. The botanical name is not yet known.

(9.) The "Aganokwi" (?), *Mimusops multinervis*, Baker, is a tree yielding a good rich-coloured hardwood resembling mahogany: it is frequently figured, and should command a ready sale in Europe. It is known as "Bakum Mahogany," and is very widely distributed throughout the Central Province, but is of smaller growth than in the Benin City district, where it attains a height of 120 ft. and 40 ft. girth. It grows on high as well as on low land, but the development of the tree near the swamps of the Niger is very poor, and the trees do not attain a large size. Value $2\frac{1}{2}d.$ to $4d.$ per foot.

The species is very plentiful in some of the moist evergreen forests of the Protectorate and has a tendency to grow gregariously. It has been exported home under the general trade name of mahogany.

(10.) The "Arachi", *Afzelia africana*, Sm., is another tree which yields an excellent hard wood. It is quite plentiful in parts of the Onitsha district and again in the mixed forests of the Western Province. It is largely used in the Central Province for furniture and building purposes.

(11.) The "Eba," or red iron-wood tree. This appears to be a species of *Lophira*, and unlike its congener *Lophira alata*, Banks, of the dry open forests, is confined to the fresh water swamps of the moist zone, where it is plentiful, more especially in parts of the Benin City district. The wood is very hard,

close grained and heavy, and is said to resist the attacks of both white ants (*Termites*) and the Teredo worm. It should prove suitable for all purposes where strength and great durability are required. The wood is, however, rather difficult to work. Experiments are being undertaken with a view to ascertaining its suitability for railway sleepers.

It attains a large size, up to 20 ft. in girth, with straight stem and few branches, on the moist low lands, and is usually found in company with real mahogany, and very few other trees. A deep and moist soil is required, but with drainage this tree develops rapidly as a seedling.

(12.) The "Odonomokyukyu," of the Benis, a species of *Santiriopsis*, probably *Santiriopsis Klaineana*, Pierre (?), is common in the evergreen forests of this country. The wood is much valued in the French and Belgian Congo, and is sometimes exported to Europe.

(13.) *Detarium senegalensis*, J. F. Gmel., is a magnificent lofty leguminous tree, the wood of which has been exported in past years to Liverpool under the trade name of "African Mahogany." It is confined to the evergreen forests and is rather uncommon.

(14.) The "Agba," of the Benis, an unidentified tree with a light-coloured wood, which has also been exported from the Benin district as a kind of mahogany. It is fairly common in some districts of the Central Province.

(15.) The "Iroko", *Chlorophora excelsa*, Benth., is one of the best timber trees of West Africa. It is most plentiful north of the evergreen belt, and its wood is extensively used on the coast for making furniture and for building purposes. The timber is very durable, hard and of a yellowish colour when fresh, but rapidly darkens to a rich brown and becomes almost black. The grain is straight, though a little fibrous at times. The tree grows in a deep and somewhat moist soil, avoiding a dry one, and the natives say that its roots must reach running water. The value is 2*d*. per foot. Seed has not yet been collected, but small seedlings are often seen and apparently develop quickly. It grows to a very large size ;—the great "Juju" tree everywhere—and sometimes attains a girth of 30 ft. though only 80 to 90 ft. in height.

(16.) The "Camwood" of Southern Nigeria is procured from two species of leguminous trees, viz., *Baphia nitida*, Lodd., and *Pterocarpus tinctorius*, Welw. ; the latter is a large tree which is confined to the moist evergreen forests.

Baphia nitida is rather inclined to be shrubby and appears to be extensively cultivated round villages. I do not think that it is found growing wild in the forests in any large numbers.

(17.) "Padouk," "Ume," "Barwood," *Pterocarpus tinctorius?* has a rich red wood, which fetched £10 per ton when the market happened to be good, but subsequent shipments have reduced the price. It has not been sent since February, 1905. The natives use it as a dye-wood, exporting it especially to Lagos. Trees to be thus used are usually felled some years before the

timber is split up into the little pieces, which they sell at so much the basket load, 3*d.* to 6*d.* The tree is common and is found all over the Central Province; it grows chiefly on the lower-lying land and attains a girth of 9 ft. as a maximum.

There are two other hardwood trees, found in the moist evergreen forests of the eastern portion of the Western Province and the southern portions of the Central Province, that deserve mention. They belong to the genus *Piptadenia* and attain large dimensions. The timbers of both are excessively hard and almost indestructible, as they resist attacks from insects. The larger species "Okan" of the Benis is known locally as the African "Greenheart" and is used for house construction. The wood, however, is exceedingly hard and difficult to work, and is consequently not so frequently employed as some of the softer and less durable kinds. The other species appears to be *Piptadenia africana*, Hook. It is known to the Benis as the "Ikhimi." The wood is much lighter in colour than that of the "Okan," but is just as durable.

Of softwood trees there appears to be only one species that is likely to furnish timber suitable for the home market or to replace locally the large quantities of pitch pine imported from Europe. The timber is fairly close grained, light coloured, easy to work and very durable. It has been extensively used by the Public Works Department for building purposes along the Niger. The tree is either a species of *Sterculia* or *Cola* and has not yet been identified botanically. It reaches large dimensions, is fairly common, and has a tendency to grow gregariously; the natural regeneration is also good, and if the timber ever comes into general demand there will not only be a large supply immediately available, but it will be a comparatively easy matter to get the age gradations into a more or less normal state for future demands.

An unnamed species of *Terminalia*, common in the mixed forests of the Central and Western Provinces, is also likely to furnish timber suitable for the home markets. It is a tree of lofty growth and exceptionally good "form figure," the girth being well maintained up to a great height. The Yoruba name of the tree is "Epepe."

Ebonies.—The Ebony exported from Southern Nigeria is furnished by two species of *Diospyros*, viz., *Diospyros mespiliformis*, Hochst., of the mixed forests, and *Diospyros Dendo*, Welw., of the evergreen forests. The former is still fairly plentiful, but the majority of the large trees belonging to the latter species have been practically exhausted in the drainage areas of the Calabar and Cross rivers, from which the bulk of the Southern Nigerian Ebony used to be exported. The natives have now taken to felling immature trees of this species, and the supply of large billets suitable for the home markets will rapidly diminish in the near future.

The following additional notes have been taken from Mr. A. H. Unwin's list of the timbers of the Central Province, and refer to timber not mentioned by Mr. Thompson.

Cedar or Mahogany, "Ibegogo," *Carapa procera* (?) has only once been shipped home, and was then valued at $2\frac{1}{2}d.$ to $3\frac{1}{2}d.$ per foot as a timber with some of the qualities of both cedar and mahogany. It is very prevalent all over the Province, but is not always a very straight or tall tree, and branches rather low down. It attains a girth of 9–12 ft., and a height of 50-60 ft. Seeds are produced very freely and too early for the good of the tree.

Ebony, "Isinewey," (*Diospyros* ?). Timber from this tree was sent home and classified as mahogany with a value of $2d.$ to $3\frac{1}{2}d.$ per foot, but as far as the tree is known here, it appears to be an ebony. The wood is hard and reddish brown. This tree is very prevalent all over the western side of the Province, but does not usually attain a very large size and is only moderately straight in growth.

"Ughahan," "Sabicu," (?) *Zanthoxylum senegalense*, DC., is mentioned in the Liverpool Market as worth $2d.$ to $2\frac{1}{2}d.$ per foot, and is classified as mahogany though botanically it belongs to the Satinwood group. It is common all over the Province, and is found very often on old farms, as the seedlings appear to be light demanding. Wood very varied in texture and in colour, which is sometimes yellowish brown to dark brown. The tree grows to a fair size, 9–12 ft. in girth, and straight up to 80 ft. in height. The stem is covered with prickles even up to old age.

African Ebony, "Igidudu," *Diospyros atropurpurea*, Guerke. Sampled in 1905, and sold as Ebony with a value of £5 to £10 per ton. It is found all over the Province, especially near the Niger on the left bank, but owing to the waterlogged nature of the ground it does not attain a large size, 24 ft. being the largest yet seen by the Department, and of corresponding height. It grows on moist soil of good depth ; only a few large trees are found in the western part of the Province.

Greenheart, "Ogwega," "Furniture wood," "Oak," *Dialium guineense* (?). With the above names this timber tree has been designated, with a price varying from $1\frac{1}{2}d.$ as greenheart to $3d.$ as oak, but it has not been cut since. The tree is very common all over the western portion of the Province and occurs on fairly high land, and good soil, where it fruits readily. The wood is of a rich, red-brown colour, and the grain is rather varied from fibrous to very close. The tree grows to a large size and is moderately straight.

"Oak," "Awaw" (Benin), "Erumacie" (Benin), *Lonchocarpus* sp., near *Zenkeri*, Taub. This was classified as an oak timber, when samples were sent home, with a value of $2d.$ per foot, but has not been cut since then. The tree grows all over the Province, and attains a medium size ; it requires good loam soil. The wood is reddish-brown in colour with close to fibrous grain.

"Padouk," "Akume," *Pterocarpus* sp., has only thus far been sent as a sample ; it was valued at $2d.$ to $3\frac{1}{2}d.$ per foot, but has not been cut since. It is very prevalent all through the Province, both on the higher-lying as well as the low-lying land, and seems to do pretty well on both. The tree does not attain to a very

large size, 8–9 ft. girth being about the maximum, but the growth is straight and there are only a few branches low down. The wood is a good red colour, which pales on the surface on exposure to the air for any length of time. The natives use it as a red dye-wood, and it is sold in all the local markets even for sending to Northern Nigeria.

"Satinwood," "Obeche," *Hibiscus* (*Triplochiton*) n. sp. A valuation of $2\frac{3}{4}d.$ to 1*s.* per foot was given for a sample of this wood at the Liverpool Market, where it was classified as Satinwood. None has been cut since then. It is a very common tree, being found in many localities, and in very large examples up to 25 ft. in girth. The leaf is very much like that of an English Maple. The tree grows on high land with a good soil.

"Satinwood," "Anyairhan," *Leguminosae*. At first when this was sampled the prices varied from $1\frac{1}{2}d.$ to 1*s.* per foot, but latterly they were 2*d.* to 4*d.*, and the timber was not so well spoken of as at first. Altogether three lots of samples have been sent. Apparently it would gradually gain a position in the market. It is quite common in the Province, and attains a large size with good length of bole; 18 ft. would be the maximum stem girth. The tree grows in rich soil, of considerable depth. The stem is a brilliant red colour and the bark gradually peels off in long strips each year. The wood which is very hard and has a yellowish-green tint is close grained and works up very smooth.

XXVI.—MISCELLANEOUS NOTES.

Mr. Robert Fyffe, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Assistant to the Superintendent of the Botanic, Forestry and Scientific Department of the Uganda Protectorate.

Mr. Frank Reginald Long, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Superintendent of the Government Plantations in the Federated Malay States.

Mr. W. R. Elliott.—It is with great regret that we record the death of Mr. W. R. Elliott, Forestry Officer for Northern Nigeria. He died on March 13th, at Bedford, and leaves a wife and young family. He was 48 years of age. Mr. Elliott left Kew in 1881 and was at the Botanic Gardens, Jamaica, until 1886 as Superintendent of the Parade and King's House Gardens. From March, 1886, until April, 1889, he was Curator of the Botanic Garden at Grenada, and afterwards became Collector to the West Indian Natural History Exploration Committee. After holding various other posts in the West Indies, he was appointed Forestry Officer in Northern Nigeria in 1903 (*K. B.* 1903,

p. 31). In 1907 Mr. Elliott was invalided home from Nigeria owing to a serious illness. He appeared to have made a complete recovery, and was reported as fit to return to duty. On the 6th of March, however, he fell ill with influenza, followed by double pneumonia, which proved fatal.

Botanical Magazine for March.—The plants figured are *Sinningia Regina*, Sprague, *Cypripedium debile*, Reichb., *Pyrus Aria*, Ehrh., var. *majestica*, Prain, *Berberis acuminata*, Franch., and *Rosa Willmottiae*, Hemsl. The *Sinningia* was introduced as a chance seedling from Brazil by Mr. de Smet-Duvivier, of Ghent, and under the name of *Gesneria Reginae* was exhibited in flower at the Ghent Quinquennial Exhibition of 1903. It is an ornamental plant both on account of its leaves and its large pale violet flowers. The Kew plants were raised from seed distributed by Messrs. Benary, of Erfurt. *Cypripedium debile* is a curious little plant with small, pale green and white flowers slightly marked with brown and purple. It is a native of Japan and is found also in several localities in Western China. In this country it may be grown out of doors. Roots were purchased for Kew from the Yokohama Nursery Company. The variety of the handsome *Pyrus Aria*, which is distinguished by its larger leaves and flowers, is believed to be of garden origin. The material figured was obtained from a tree which has been cultivated for many years in the Kew Arboretum. *Berberis acuminata* is a native of Yunnan and Western Hupeh, China, and has been introduced into cultivation by Messrs. James Veitch & Sons, who supplied the material for the drawing. It is allied to *B. Wallichiana*, DC., but has narrower and more acute or acuminate leaves, with more numerous, longer, and more spiny teeth. The flowers are bright yellow and are borne in fascicles of 2 to 15. *Rosa Willmottiae* is an exceedingly pretty species belonging to the section *Cinnamomeae*, and was described first in the *Kew Bulletin*, 1907, p. 317. It was raised by Messrs. James Veitch & Sons from seeds collected for them by Mr. E. H. Wilson, in the Sangpan mountains, near the Tibetan frontier of Western China, at elevations of 9,500 to 11,000 feet. Its nearest ally is *R. Webbiana*, Wall.

Botanical Magazine for April.—The following plants are figured and described: *Bulbophyllum Binnendijkii*, J. J. Smith; *Kaempferia Kirkii*, K. Schum., var. *elatior*, Stapf; *Saxifraga Brunoniana*, Wall., *Rheum inopinatum*, Prain; and *Olearia ciliata*, F. Muell. The very striking *Bulbophyllum* is a native of Java, and differs from *B. Ericssoni*, Kraenzl., in being larger in almost all its parts. Messrs. F. Sander & Sons, who grew the plant from which the drawing was made, exhibited it at last year's Temple Show under the name of *B. Ericssoni*, and the question is not yet decided whether or not the two species should be considered identical. The beautiful *Kaempferia* was drawn from specimens presented by Mr. H. J. Elwes, F.R.S., who obtained the plant from the neighbourhood of Salisbury, Rhodesia. It is

taller-growing than typical *K. Kirkii*, the leaves are longer and narrower, and the yellow blotch at the throat of the flower is bordered on both sides with purple. *Saxifraga Brunoniana* is a pretty and curious species from the Himalaya, where it ranges from Sikkim to Kashmir at elevations of 9,000 to 13,000 feet. It has long slender stolons, which, with the stems, are bright crimson, and small yellow flowers. The Kew plants were raised from seeds received from the Royal Botanic Gardens, Calcutta, in 1903. *Rheum inopinatum* is a new species belonging to the section *Deserticolae*, in which the stems are leafless, or nearly so, and the leaves firm. It is a small-growing plant, with grey-green leaves, and a bright red or crimson inflorescence. Seeds were presented to Kew in 1905 by the Director of the Botanical Survey of India, having been collected at Gyantse in Tibet by Capt. H. J. Walton in 1904, during the Tibet Mission. The *Olearia* is a native of Australia and Tasmania, and resembles some of the species of *Aster* and *Felicia*. The plant figured was raised from seeds received in 1899 from Sergt. Goady, R.E., of Albany, Western Australia.

The South African Locust Fungus.—During the years 1895–96 locusts killed by a fungus were collected in Natal. The fungus was determined to be *Entomophthora Grylli*, Fres., a parasite previously known to be destructive to grasshoppers. In the hope of reducing the devastating hordes of locusts abounding in South Africa, attempts at its cultivation were made at the Grahamstown Bacteriological Institute, from material obtained from the infected Natal locusts. Unfortunately this attempt did not prove a success, as *Entomophthora Grylli*, Fres., was almost invariably absent from the cultures, and when present was dead as would be expected, considering the fact that this fungus can only grow in the body of a living insect. The material cultivated and distributed in a wholesale manner consisted of two distinct species of fungi, *Rhizopus nigricans*, Ehr., being alone present in the tubes of material examined by Professor McAlpine in Melbourne, whereas the material submitted to Kew for examination proved to be a pure culture of a fungus not previously described, and was called *Mucor exitiosus*, Mass. (*Kew Bulletin*, 1901, p. 94).

Material received by Mr. Hart, in Trinidad, consisted mainly of *Mucor exitiosus*, along with a sprinkling of dead *Entomophthora Grylli*.

On the whole, *Mucor exitiosus* was the most constant and abundant fungus present in the cultures.

Rhizopus nigricans is a widely distributed species, but has no injurious action on living insects.

Mucor exitiosus has not been proved to attack either grasshoppers or locusts, in fact all evidence forthcoming is decidedly opposed to this view. Soon after the "locust fungus" preparation was issued, it was subjected to a thorough examination at the Colorado Experiment Station, United States, and as the result of

numerous experiments conducted on scientific principles, it proved an utter failure, the locusts that died during the experiments being found to have succumbed to the feral form of *Entomophthora Grylli*, and not to *Mucor exitiosus*.

Exactly similar conclusions have recently been arrived at independently by Dr. Butler in India, and by Mr. I. B. Pole Evans in the Transvaal, after experimenting with the "locust fungus."

From the above account it is evident that the "locust fungus," from which so much was expected, is of no value as an exterminator of locusts, and as *Entomophthora Grylli* cannot be cultivated artificially its action is limited and uncertain, yet it appears highly probable that in those cases of reported success following the use of the "locust fungus" preparation, the amount of such success depended in reality on the action of the last-named fungus.

Quite recently Mr. W. S. Marais, of De Poort, De Aar, has recorded a successful method of destroying locusts wholesale, by the use of arsenite of soda and sugar. One pound of arsenite of soda and four pounds of sugar are dissolved in five gallons of water in a ten gallon drum. Green grass (osgras and klitgras) is then taken and cut up very fine, into pieces not more than an inch long, and the drum is filled with it. The mixture is allowed to soak during the night, and in the early morning it should be spread very thinly round the bushes on which the locusts are sleeping. They begin to feed directly they move, and the swarms are completely destroyed. The grass should be spread so thinly that stock cannot pick it up, and what the locusts leave is soon dried up in the sun.

The above amount was used for locusts in the hopper stage, and where more advanced, two pounds of arsenite of soda and eight pounds of sugar should be used with the same amount of water as given above.

Mr. H. Maxwell-Lefroy points out that a wide bag on a frame is used extensively in India for the destruction of the hoppers of the Bombay Locust. The bag is run through the field fairly rapidly. At the end of each run the bag is twisted up and the insects shaken into a corner and destroyed.

The use of a bag net is also recommended as one of the methods for exterminating locusts in the Caucasus, and an account of the instructions issued for dealing with the pest in that region is given in the *Kew Bulletin*, 1894, p. 215.

Mr. I. B. Pole Evans' paper on the South African locust fungus has been reprinted as a leaflet (No. 5) from the *Transvaal Agricultural Journal*.

G. M.

The accompanying plate reproduced from a photograph taken in Nyasaland gives some idea of the ravages caused by a plague of locusts.

Trees and bushes covered by a swarm of Locusts. From a photograph taken in Nyasaland.

To face page 198.

New Rubber-containing Plants.—Rubber (including gutta-percha) is known to occur in about a dozen familes of plants, of which the more important are the *Euphorbiaceae*, *Urticaceae* (*Moraceae*), *Apocynaceae*, *Asclepiadaceae* and *Sapotaceae*, whilst the *Loranthaceae* and *Compositae* will probably also become of considerable importance in the near future (see *Tropenpflanzer*, 1905, p. 633 ; and *Kew Bull.*, 1906, p. 218 ; 1907, p. 285). In the remaining five families the occurrence of rubber is at present a matter of theoretical interest only, as it has not yet been shown that its extraction would be remunerative ; they are the *Trochodendraceae* (*Eucommia*), *Tiliaceae* (*Plagiopteron*), *Celastraceae*, *Hippocrateaceae* and *Lobeliaceae* (*Siphocampylus*), whilst a sixth, *Convolvulaceae*, is given by Czapek as also containing rubber (*Biochemie*, vol. ii, p. 709).

The presence of rubber in three African species of *Gymnosporia* (*Celastraceae*) is recorded in the *Notizblatt des Königl. botanischen Gartens und Museums zu Berlin*, No. 42 (Bd. V.), of March 11th, 1908, by Dr. Th. Loesener, who prefaces his account by a summary of our knowledge of the occurrence of rubber in the family.

Radlkofer, who was the first to detect rubber in the *Celastraceae*, found it in the Mexican genus *Wimmeria* (*Bot. Gaz.* vol. xviii., 1893, p. 199). The leaf anatomy of the *Celastraceae* was afterwards investigated with special reference to the occurrence of rubber by Metz, who recorded its presence in special laticiferous cells of the leaves in eight species of *Wimmeria* and in the South African *Mystroxylon eucleaeforme*, whilst in no fewer than thirteen genera, rubber was present in the form of small masses in the cells of the parenchyma (*Beih. Bot. Centralbl.* vol. xv., p. 309) ; in some of these genera however, the rubber may have been present in laticiferous cells in the stem and root, although not occurring in special cells in the leaves ; this was found to be the case in *Euonymus*, for example, by Col (*Comptes Rendus*, vol. cxxxii., 1901, p. 1,354).

It is obvious that the extraction of rubber could not be profitably undertaken, where it is present merely in the cells of the parenchyma. In the three species of *Gymnosporia* investigated by Loesener, however, the rubber is present in special laticiferous cells, which occur in the bark, the leaves and the inflorescence, but it is still unknown whether the rubber is of sufficiently good quality and present in sufficient amount to make its extraction profitable. Further information is also required as to the geographical distribution of the three species and their mode of occurrence, before an opinion can be formed as to the value of Loesener's discovery. The presence of the rubber may be detected by carefully breaking in two a leaf or a piece of bark, when the portions remain connected by fine elastic threads which stretch from one broken surface to the other and which can be drawn out for a fair distance before breaking, when they rebound and curl up.

The three species, which are closely allied to one another, are all spineless and are natives of intertropical East Africa. Two of them, *G. amaniensis*, Loes., and *G. bukobina*, Loes., are new

species, of which the descriptions will appear in the forthcoming part of *Engler's Botanische Jahrbücher*, vol. XL., now in the press : and the third, which was described by Loesener in 1893 as a new species, *G. lepidota*, Loes. (*Engl. Bot. Jahrb.* vol. xvii., p. 549), is now regarded by him as a variety of the common and polymorphic *G. acuminata*, Szysz., a native of South Africa.

G. amaniensis was collected by Warnecke in the neighbourhood of Amani, East Usambara, at an altitude of about 2,700 feet, and is described as a relatively slender tree, attaining a height of 100 feet. *G. bukobina*, on the other hand, appears to be a climber ; it was discovered in 1903 by P. Conrads not far from Bukoba, to the West of Victoria Nyanza, at about 4,000 feet. *G. lepidota* seems to be more widely distributed than the other two, even if we regard it as distinct from *G. acuminata*, having been recorded from Mts. Ruwenzori, Kilimanjaro and Mawensi, and from the Uluguru Mountains in Ukami, at altitudes varying from 7,000 to 11,000 feet above sea level. According to Loesener it is a tree about 33 feet high, but Dawe, who collected it on Ruwenzori at about 11,000 feet describes it as a shrub 10 feet high, and no doubt the height varies according to the altitude and exposure. In the Uluguru Mountains the tree is called "Mbamala" by the natives, according to Goetze.

T.A.S.

Botanic Gardens, Olokemeji, Southern Nigeria.—These gardens were formed in 1901 to take the place of those at Ebute-Metta on the partial appropriation of the latter for other purposes. The ornamental portion of the gardens, together with the arboretum, comprises about $4\frac{1}{8}$ acres, but the garden proper consists of 156 acres laid out in plots, edged with grass verges, and each plot is, as far as possible, devoted to products of a like kind, such as Fibre, Fruit, Rubber, &c.

The fibre plot contains *Boehmeria nivea*, *Urena lobata*, *Sansevieria guineensis*, *Furcraea gigantea*, *Agave rigida*, var. *sisalana*, *Hibiscus esculentus*, all of which give good results.

Of fruit, specimen trees of Mango, Pitanga cherry, *Anacardium*, Guava, *Zizyphus*, Pomegranate, *Anona* sp., *Achras Sapota*, *Artocarpus integrifolia*, and various members of the *Citrus* family such as Citron, Orange, Lime, Grape-fruit, Shaddock, etc., are established and are valuable in furnishing seeds, from which plants are raised for distribution. Pineapples are grown in large quantities to furnish suckers for distribution, and grow with remarkable freedom, plants fruiting twelve months after being planted.

A plot of *Coffea liberica* and one of *Coffea arabica* are giving good results. Cacao is almost a failure in this district owing to insufficient rainfall.

The plot devoted to rubber contains *Landolphia owariensis*, *L. florida*, *L. Thompsonii* and *Funtumia elastica*, the latter a demonstration plot grown entirely in the open. A number of Para rubber trees planted in 1902 are well established, but are not a great success in this part of the country.

Specimens of timber trees are growing in different parts of the garden including *Tectona grandis*, *Cedrela odorata*, *Swietenia Mahagoni* and the indigenous *Chlorophora excelsa*, *Diospyros mespiliformis* and *Mimusops multinervis*.

A plantation of *Cocos nucifera* planted in 1902 close to the river is well established.

Poinciana regia, *Terminalia Catappa*, *Albizzia Lebbek*, and *Hura crepitans* are grown as shade trees, and plants raised in the gardens are being planted extensively in the streets of towns and at all railway stations.

A considerable portion of the garden is devoted to raising plants for distribution and is laid out in seed beds ; Kola, Cacao, and Para rubber are raised in large quantities, 15,000 seeds of Kola, and 38,000 Para seeds being imported for raising plants for distribution during the current year.

Twenty-six acres of land are devoted to growing farm crops. Experiments are being conducted with a view to improving the native yam, and for this purpose eight different varieties have been planted this year.

Experiments in Cotton are conducted each year, and improvement by selection is now being undertaken.

A plantation of Bananas introduced from the West Indies is a striking success, and a large number of suckers are distributed. A plantation of *Musa Cavendishii* has been recently formed.

Arrowroot, Ginger, Ground-nuts, Guinea-corn are also under cultivation.

Along two sides of the garden there are ornamental borders of indigenous plants, most of which are labelled with their scientific and native names.

There are also various specimens of indigenous economic trees, such as *Lophira alata*, *Anogiessus leiocarpus*, *Pterocarpus erinaceus*, *Strophanthus gratus*, &c.

The Herbarium, which has been formed during the last two years, now contains over 200 specimens correctly named, and should prove of great value.

Botanic Garden, Ebute-Metta.—When the new garden at Olokemeji was formed, it was proposed to abandon the garden at Ebute-Metta. Owing to its value, however, as a place of popular resort for the inhabitants of Lagos, it is now being maintained as a purely ornamental garden. The garden has an area of about three acres, and is under the charge of a native Assistant Curator.

Botanic Stations in the West Indies.—In the Reports for the year 1906–07, issued by the Imperial Commission of Agriculture for the West Indies, brief histories of the various Botanic stations have been given. The Reports, which give an interesting account

of the present condition of Botanical enterprise in the islands, are illustrated by some good photographs of the different gardens and of some of the more interesting plants grown therein.

The history of the Botanic Station at St. Lucia was reprinted in the last number (No. 3) of the *Kew Bulletin*, p. 142.

Dominica Botanic Station.—The history of this station is taken from the Reports for 1906–07.

"The Dominica Botanic Station was established on its present site in 1891. It is about 44 acres in area, and lies immediately at the back of the town of Roseau, about ½ mile from the landing place. It is on the right-hand side of the public road leading up to the Roseau Valley, and terminates near the first bridge over the Roseau River. Immediately above it, to the south-west, is the Morne, an elevated plateau about 500 ft. above the level of the sea. On the edge of the Morne, overlooking the station, are precipitous cliffs, and at the foot of these are easy slopes, suitable for cultivation. The land is undulating, with a rich sheltered hollow immediately under the Morne. In other places the soil is somewhat stony, and not so suitable for the growth of plants. There is, however, no part of the land not suitable for some cultivation or other. The site is well sheltered from prevailing winds to the south and east. On the northern side it is somewhat exposed. An abundant supply of water is available from the mains of the Roseau reservoir, which pass through the middle of the station.

"The objects in view in establishing this station were strictly experimental and economic. Ornamental plants were to be grown in moderate quantities for rendering the ground attractive and interesting, but chief attention was to be devoted to plants of an economic or industrial character, and especially those likely to be in demand for establishing new industries in Dominica. Again, the more the cultural operations of every kind were carried on as object-lessons for the instruction of the people, the better would the station fulfil its mission as a factor in the development of the resources of the island. A large number of very useful and interesting plants already existed in the island at St. Aroment, the property of Dr. H. A. A. Nicholls, C.M.G. These had been sent out from time to time from Kew, to the late Dr. Imray and Dr. Nicholls in exchange for Dominica plants kindly contributed at the private expense of these gentlemen. This collection was one of the best in the Leeward Islands.

"The first Curator was Mr. Charles Murray, from the Edinburgh Botanic Gardens, who was appointed September 9, 1889. He was soon after transferred to Grenada. Mr. Henry F. Green was appointed to succeed him, August, 1890. The work of laying out the ground of the present station was carried out by Mr. Green, and he also took a deep interest in forming the present successful plots of economic plants. Mr. Green resigned in February, 1892, to take charge of a private enterprise in the north of the island. Afterwards he became Superintendent of a Reformatory School at Roseau, until it was abolished in 1896. The next Curator was

Mr. Joseph Jones, who was trained at Kew. He arrived in the island in March, 1892. Mr. Jones immediately took up the duties of his office with energy and enthusiasm and he has proved an excellent Curator. It is stated in evidence that he has rendered 'services universally acknowledged by the planters of the island.' Mr. Jones has held this position up to the present time.

"The chief object of the garden has been to raise and distribute at moderate rates plants of an economic character and this work is steadily developing.

"In 1892, 17,000 plants were distributed, whilst in 1906–07 the number had risen to 83,000.

"Mr. G. F. Branch was appointed Agricultural Instructor in January 1900, and transferred to Grenada in July 1905, where he now holds a similar position. Since Mr. Branch left Dominica, the post of Agricultural Instructor has not been filled.

"On the establishment of the Agricultural School at Morne Bruce in December 1900, Mr. D. Tannock, who had been appointed from Kew to the Agricultural Department, Dominica, became Officer-in-charge. In April 1903, Mr. Tannock resigned to take up an appointment in New Zealand. He was succeeded by Mr. A. J. Brooks, who arrived from Kew in June 1903, to take up the duties of Officer-in-charge. He has continued in that capacity until the present time.

"Mr. Rudolph Penn was appointed schoolmaster at the Agricultural School in December 1900.

"In 1898, a foreman was appointed to the Botanic Station, and this post has been maintained continuously up to the present time."

Montserrat Botanic Station.—The following account of this station is taken from the Report for 1906-07.

"The work of the Imperial Department of Agriculture in Montserrat was begun by the appointment of the late Mr. A. J. Jordan, in 1899, as Agricultural Instructor, and the establishment, in 1901, of three Experiment Stations. These stations were situated at the Grove estate, at Harris' Village, and at Olveston respectively, and have been maintained from the time of their establishment up to the present. Grove Station, which is ½ a mile from the town of Plymouth, has been the headquarters of the Agricultural Instructor in Montserrat, and has combined with its work as an experiment station, the functions of a Botanic Station, while the Harris and Ovelston Stations have been maintained solely for the purpose of carrying out agricultural experiments.

"In 1899, Montserrat experienced a disastrous hurricane, owing to the effects of which, agricultural matters were in a very depressed condition at the time when the Imperial Department of Agriculture began its work in this island.

"During the two subsequent years, attention was particularly directed to aiding the peasants by means of the introduction of good varieties of yams, sweet potatoes, sugar-cane cuttings, and other food crops.

"In the meantime, experiments were carried on at the stations with these, and such other crops as seemed likely to give remunerative returns if grown on a commercial scale. In 1904, the title of the Officer-in-charge of the Experiment Station was changed from Agricultural Instructor to Curator.

"In 1905, Mr. Jordan was appointed Curator of the Botanical Gardens at Antigua, and Mr. W. Robson, the present Curator, was appointed to succeed Mr. Jordan at Montserrat. During the interval between the departure of Mr. Jordan and the arrival of Mr. Robson, the duties of the Curator were performed by Mr. E. Buckmire, foreman of the Botanic Gardens at St. Lucia. On June 1, 1900, Mr. Dudley Johnson was appointed Local Instructor, which post he has retained up to the present time."

St. Kitt's-Nevis Botanic Station.—The history of this station is taken from the Reports for 1906–07 on the Botanic Station, &c., for St. Kitt's-Nevis.

"The Botanic Station in St. Kitt's was established in the latter part of 1899. The first Curator, Mr. Charles Plumb, was appointed in October of that year.

"The site of the present station was selected by Mr. (now Sir) Daniel Morris, Assistant Director, Royal Gardens, Kew, towards the end of 1890, when he was in the West Indies on an official visit in connexion with the Botanic Stations. The land so selected originally formed part of a sugar estate, La Guerite, which had been purchased by the local Government.

"The station was laid out by Mr. Plumb during the years 1891 and 1892 according to the plan laid down by Mr. Morris, and considerable time and money were spent in making roads and planting wind-belts of trees to protect the station from the effects of the sea blast and high winds.

"Mr. Plumb continued in charge of the station under the supervision of Mr. C. A. Barber, the then Superintendent of Agriculture for the Leeward Islands, until March 1, 1893, when he resigned, and Mr. Wade was appointed in his place.

"On the abolition of Mr. Barber's office, Mr. Wade continued in charge until October, 1898, when Mr. W. Lunt, who had been trained at Kew, and who had been for some years at the Royal Botanic Gardens, Trinidad, was appointed Curator, with Mr. Wade as foreman.

"Mr. Lunt died on January 3, 1904, and the present Curator, Mr. F. R. Shepherd, who was then Superintendent of Skerretts Training School at Antigua, was appointed to act as Curator for one year, and at the end of that time was confirmed in the appointment."

Tortola Experiment Station.—The history of the station is taken from the Report on the Experiment Station, Tortola, Virgin Islands, for 1906–07.

"The Imperial Department of Agriculture began its work in the Virgin Islands in 1900. A partly abandoned sugar estate to the north-west of Road Town was chosen as the site for an

Experiment Station and was purchased from the funds of the Imperial Grant-in-aid. This estate consisted of about 160 acres of land, nearly one-half of which is a steep hillside. At the time of its purchase, the old sugar works had fallen into a state of disrepair and the sugar mill was practically useless.

"Mr. C. W. Seale was appointed Agricultural Instructor in charge of the Experiment Station. Under his direction a house was built for the use of the Agricultural Instructor; necessary roads were laid out, and model plots were established which were planted up in limes, seedling canes, cacao, coffee, fruit trees, &c. In 1902, Mr. W. C. Fishlock was appointed Agricultural Instructor, and he has held that post up to the present time.

"A well has been sunk and an aermotor erected for pumping water. This ensures a permanent and regular water supply to the Experiment Station. A small Chatanooga mill has been purchased and established in the old sugar works. The sugar battery has been entirely rebuilt and the buildings have been put in a fair state of repair. More recently a building has been erected to serve as a cotton factory, and suitable machinery for ginning and baling the cotton has been placed in it.

"On taking over the property the Department let out about 46 acres to twenty-four tenants on the part-payment system, the tenants binding themselves to plant certain crops, and the Department agreeing to put them in full possession of their plots at the end of seven years. This agreement commenced in 1902, and, it must be confessed, does not seem likely to end satisfactorily.

"The land reserved for the station proper, about 14 acres, was laid off in plots of 1 acre and planted with various crops. One plot was planted with limes, a second with seedling canes, a third with various fruit trees, a fourth with pine-apples, a fifth with cacao, and a sixth with coffee, and so on.

"These crops have mostly been successful and have served to indicate what crops may be grown in Tortola. As regards outside work, it may be mentioned that a woolless breed of sheep which is well suited to the place has been introduced. A young Toggenburg goat was also imported with a view of improving the local breed of goats."

Cacao Pests of Trinidad.—In the *Proceedings of the Agricultural Society of Trinidad* for December, 1907, an interesting and useful paper is given on the Cacao pests of the Island, with notes upon miscellaneous crops, by Mr. O. W. Barrett, of the United States Department of Agriculture. The article has been re-issued as a separate "Society Paper," No. 280.

Both fungal and insect pests are dealt with, the most important of the former being a species of *Lasiodiplodia*, a genus of *Sphaeropsidaceae*. Spore dispersion and remedies are discussed, but the only remedy against the fungus appears to be the destruction of the diseased tissues.

The importance of "Cover Crops" to prevent cracking of the soil and consequent loss of water is also dealt with, and leguminous plants of the genera *Desmodium*, *Cassia*, *Mucuna*, *Vigna*, *Crotalaria* and *Sesbania* are recommended for this purpose, since

they also tend to enrich the soil with nitrogen. Under the heading "Shade" it is suggested that young plants require some protection to prevent the roots becoming dry, but that, as far as the effect of direct sunlight on the leaves is concerned, shade does not appear to be advantageous. The planting of the Immortelle (*Erythrina umbrosa*) as a shade tree is considered to be harmful rather than beneficial to the Cacao trees.

Pruning, picking, spraying and fertilizers form the subject of short paragraphs, and some notes on the pests of other crops, such as Sugar Cane, Bananas and Cocoanuts, are also given.

The article concludes with the following summary :—

"Placing the value of the normal cacao crop of Trinidad at $10,000,000·00 net per annum under existing erroneous agronomic methods and the common malpractices of culture, it is estimated that between $3,000,000·00 and $5,000,000·00 value of pods are lost through fungus attack, of which at least 30, if not 50 per cent. could be saved with proper attention only to the methods of preventing fungus infection.

"It is also estimated that the present normal yield of cacao could be readily more than doubled by the application of fertilizers, proper tillage of the soil, and the substitution of leguminous cover crops for the shade trees now employed.

"Probably 80 per cent. of the loss of pods and woody tissue is caused by a species of fungus belonging to the genus *Lasiodiplodia*, though there are several other fungi which cause various rots of the fruit and cankers of the stem and branches.

"The direct loss from insects is comparatively slight, though there are numerous ecological problems along this line which require investigation.

"The weather—aside from the wind movement and prolonged drought—has comparatively little direct effect upon the growth or fruiting of the cacao itself, though it may largely influence the action of parasitic fungi. The average cacao tree on the ordinary plantation in Trinidad and Tobago is severely suffering from fungus attacks and from lack of sunlight and soil nourishment ; under favourable conditions it should produce from two to three times its present yield."

Mud-binding Grasses.—In the *Journal of the Board of Agriculture of British Guiana*, Vol. I., No. 3, 1908, appears an article on the use of "Wild Rice," *Spartina brasiliensis*, Raddi., as a resistant to coast erosion. The Courida, *Avicennia nitida*, Jacq., is the commonest tree fringing the Coast in British Guiana and the Black and White Mangroves (*Rhizophora Mangle*, Linn., and *Laguncularia racemosa*, Gaertn.) also occur in quantity. They grow in the soft mud, and at every high tide their roots are covered by the sea. The Mangrove, however, on account of its wide-spread roots, was considered better than the Courida in protecting the foreshore. Recently the discovery of the value of the "Wild Rice" for accumulating mud has led to a development of the systematic planting of this grass, which has proved to be successful. The grass has been planted in rows about six feet apart, each plant

being about two feet from the next, and the plants are put in about one foot below the surface. When the grass has become firmly established Mangrove seedlings have been planted amongst it, and these appear to have flourished without any further trouble. As the Mangroves grow they form so thick a shade that the grass dies out, but by this time the Mangroves are now large enough to prevent coast erosion without the aid of the *Spartina*. The value of the "Wild Rice" grass then is due to the fact that it appears to be the only plant which is able to establish itself in the soft shifting mud on the seaward side of the fringe of Courida or Mangrove, and in this position it accumulates mud on which it is possible for the Mangrove to become established.

New Garden Plants of the Year 1907.—Appendix III. of the *Kew Bulletin* for the current year, consisting of a list of plants new to cultivation or of noteworthy plants reintroduced in 1907, has been drawn up by Mr. Skan as in former years, and is now published.

Raffia fibre from Madagascar.—The fibre is derived from the petiole of a species of *Raphia*. It agrees so closely in microscopic structure with a sample of fibre from the petiole of *Raphia pedunculata*, Beauv., in the museum at Kew, that there can be little doubt that this is the species concerned.

A single fibre, when complete, consists of a vascular bundle enclosed in a fibrous sheath. In a transverse section of the whole, the fibrous sheath, which is five or six cells in thickness, is seen to be slightly interrupted at two points. The vascular bundle includes one group of wood-vessels, and two masses of soft bast, arranged as in several other Palms. A striking feature is the large amount of soft parenchymatous tissue lying between the fibrous sheath and the woody part of the vascular bundle.

The structure of the petiole of another species of *Raphia* (*R. vinifera*, Beauv., var. *taedigera*) was examined by way of comparison. Here vascular bundles of a similar type, each with its fibrous sheath, are scattered over the cross-section, being embedded in soft parenchymatous tissue, in which there are a certain number of much smaller bundles.

The fibres are somewhat laterally compressed, being roughly oval in cross-section, and show two external longitudinal grooves corresponding to the interruptions in the fibrous sheath. The external surface is generally clean, but, here and there, portions of the adjacent soft tissue (belonging to the petiole) remain adhering to it. The greater diameter of the fibres in the sample varied from 1 to 1·5 mm., and one specimen measured nearly seven feet in length. As the fibrous sheath is comparatively thin, and as there is a large amount of soft tissue within it, the fibre may easily be crushed flat, and hence resembles a straw. In this it differs from the fibres in the lower part of the petiole of different species of *Raphia*. These have a much thicker fibrous sheath, which encloses much less soft tissue with the vascular bundle. They are consequently quite hard and stiff, and, under the name of 'bass' or 'piassaba' fibre, are used for making brooms in the same way as the corresponding fibres of other genera of Palms.

The fibre appears to be identical with that described and figured by Perrot and Goris (Recherches sur les pailles à chapeaux de Madagascar, in L'Agriculture pratique des pays chauds, 7 Année, No. 57, Dec. 1907, p. 484, Pl. XIII.) under the native name of "Ahipotsy" or "Hahipotsy." The authors remark: "La structure anormale de cette paille ne nous permet pas de la rapporter à une plante ou un groupe de plantes déjà connu," and add: "Cette paille doit cependant arriver dans le commerce, car elle nous fut envoyée d'Italie pour être identifiée."

Perrot and Goris speak of the fibres as "petites tigelles," and refer to the superficial cells as "cellules épidermiques." They thus appear to have regarded the fibres as representing the entire stem of some plant, and it is, no doubt, for this reason that they found the structure so abnormal. They give good illustrations of the microscopic structure (l.c., Pl. XIII), but the apparent cavity near the centre of the bundle, described by them as a "large lacune," is really a pitted wood-vessel.

L.A.B.

French West Africa.—Under the direction of the General Government of French West Africa a series of very useful and interesting publications have appeared dealing with agricultural matters. In 1906, a brochure on Cotton by M. Yves Henry, Director of Agriculture, was published consisting of 346 pages and illustrated by excellent maps, photographs and drawings. In the same year M. Yves Henry published a similar treatise on Rubber in which a history of the Rubber industry in the five French colonies is given, together with the rules laid down in connection with the industry in 1905 and the results obtained in the year 1905-06. A series of excellent photographs and a map are included in the volume.

The agriculture of Dahomey forms the subject of a volume of 110 pages by M. N. Savariau, Chief of the Agricultural Service, in which among other things an account of the Oil Palm industry is given with some excellent photographs of the palms and of the method of preparation of the oil by the natives. At the end of the volume there is a clear agricultural map of the country.

Under the title 'L'Élevage,' M. C. Pierre, Chief of the Zootechnical Service, treats of the animals used in West Africa, and gives a very useful account of the principal fodder plants of the region.

These four volumes were published on the occasion of the National Colonial Exhibition at Marseilles.

They have been followed by an account of the Cotton industry in French West Africa in 1906, published by M. Yves Henry in 1907, and by a volume entitled 'L'Arachide,' published this year by M. Jean Adam, Inspector of Agriculture, dealing with the origin, geographical area, varieties, culture, products, &c., of *Arachis hypogaea*. As in the case of the other volumes, there are very useful maps and interesting illustrations.

The volumes are issued by M. Challamel, of the Maritime and Colonial Library, Paris.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 5.] [1908.

XXVII.—ECANDA RUBBER.

(*Raphionacme utilis*, Brown & Stapf).

OTTO STAPF.

In 1906, Mr. C. E. de Mello Geraldes, Professor in the Instituto de Agronomia e Veterinaria at Lisbon, published in his "*Estudo sobre os latex borrachiferos*," pp. 143–172, an article dealing with a new rubber plant known in Benguela as 'Ecanda' or 'Marianga.' But it was only in the summer of the following year that the discovery became more generally known through a short abstract from Prof. Geraldes' paper published in *The India Rubber World* (vol. xxxvi., p. 300). About the same time, in July of last year, a portion of a tuber was submitted to Kew for identification by Mr. Spencer Brett on behalf of Messrs. Gow, Wilson & Stanton, Ltd. It was stated to yield good rubber, and to have been sent "from the neighbourhood of Lake Nyasa." The tuber was made out to belong most likely to the Asclepiadaceous genus *Raphionacme*. Later on in the year Kew received from the Companhia de Moçambique a number of healthy specimens of 'Bitinga Tubers' or "Tubers of the plant from which the 'Bitinga' Rubber is extracted." They were evidently identical with the tuber communicated by Mr. Brett and stated to have come from West Africa. The tubers have been grown in the Royal Gardens and one of them flowered early in March of the present year. Although it is proposed to figure and describe the plant in the Botanical Magazine, it seems desirable in this place to give a preliminary description and a general account of the plant and its properties.

The 'Bitinga' plant agrees very well with the description and figures given by Prof. Geraldes, of the 'Ecanda' plant, and there is practically no doubt that they are identical. It is a new species of *Raphionacme*, nearly allied to *R. Welwitschii*, Schlechter & Rendle, a native of Central Angola, and is described below as *Raphionacme utilis*, Brown & Stapf. It differs from all the rubber

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plants already known in so far as it is a dwarf herbaceous plant with a fairly large subterrestrial tuber abounding in caoutchouc. As practically all our knowledge concerning the distribution, properties of the plant, and the process of working it, is at present confined to what we may learn from Prof. Geraldes' article, a translation of the more important paragraphs is given here.

"The interest attaching to the 'Ecanda' or 'Marianga' rests not only on the fact that we have to deal here with a new species and moreover one which is morphologically different from all the other known rubber plants, but also, and more especially, as I believe, on its capacity of producing first-class rubber and the facility of working it, in which respect it has no rival.

"The 'Ecanda' is a herbaceous, stemless plant with a tuber-shaped root fairly large and rich in latex.

"From experiments made in the interior of Benguela in order to find out the best process for the preparation of Ecanda rubber, I came to the conclusion that the only rational and practical method is by crushing the roots and treating the latex thus obtained by one of the processes of 'lato-borrachificaçao externa' (coagulation of the latex after extraction). It is evident that the method of first extracting the latex very much simplifies the preparation of rubber and clearly results in considerable economy. The 'Ecanda' or 'Marianga'* is found in the treeless, sandy and alluvial tracts (anháras) of Bailundo and Bihé and the Xánes (sandy and treeless tracts) of the region between the rivers Kwanza and Zambese (Ganguellas), the home of the Otarampa (*Carpodinus chylorrhiza*).† Those tracts occur locally, as a rule near the headwaters and along the banks of the rivers, occupying, sometimes, vast areas, and it is in their drier parts that the 'Ecanda' thrives. The altitude of the region where the 'Ecanda' grows is from 4,000 ft. (Ganguellas) to 5,500 ft. (Bihe).

"As stated, the laticiferous tubes of the 'Ecanda' are found spread all over the pulp of the root; at the same time the latex, being very concentrated, coagulates rapidly in contact with air. It is therefore not possible to extract it entirely from the roots by means of incisions.

"The extraction of the rubber direct from the roots necessitating, as it does, first prolonged boiling and then crushing, followed by repeated washing is not practical since, apart from the tediousness of the process, it implies necessarily the use of chemical agents in order to secure the complete separation of the caoutchouc from the pulp by the disorganisation of its tissues. And even so, unless dissolvents are used for the purification, the rubber remains somewhat impure as may be well imagined.

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* 'Ecanda' is the name by which the species (which occurs in Bailundo and Bihe) is known to the Bailundes and Bihanos, and it is, I assume, identical with the species known to the Lutxases (Ganguellas) as 'Marianga.'

† I suppose that the 'Ecanda' also occurs in the Xana of Xifumage (an affluent of the Zambese which I have crossed). a vast, treeless, sand and humus plain to the north-east of the district of Benguela. But when I traversed it, the natives had set fire to it as they are used to do, and the whole vegetation was destroyed.

"But to my great satisfaction I made sure that it was possible to extract the latex of the 'Ecanda' (although mixed with the sap of the roots) with great ease by means of simply crushing the roots. To extract the latex proceed as follows:—After having washed the roots well, cut them into several pieces at a right angle to their greatest diameter and subject them to a slight pressure in a copying press. When the liquid ceases to flow raise the top of the press, turn the pulp and subject it anew to slight pressure. Repeat these operations as long as the liquid comes out yellowish and without streaks of white, that is to the point when the latex is completely extracted and only root sap continues to flow.

"To obtain this result it is necessary to extract from the roots, on the average, 77·7 per cent. (of the weight) of the liquor; hence the latex is much diluted (1·5 per cent. of the liquid extracted from the roots should on the average be pure latex). Having found a practical process for extracting the latex, I tried now to determine the best method for coagulation.

"I obtained good coagulation with alcohol or brandy whenever the latex was not very much diluted. This process is evidently not economical as the coagulating agents are dear. . . .

"Acetic acid, sulphate of aluminium and potassium, phenol and chlorate of sodium do not act on the latex diluted with root sap. . . . Other coagulating agents I was not able to try. . . . It is, however, probable that coagulation of the latex of 'Ecanda' may be obtained with other agents, even when it is diluted with root sap.

"The process of skimming leaves much to be desired, since, in my experiments, I have never succeeded in extracting by this method more than half of the caoutchouc contained in the latex . . .

"I also studied the effect of heat on the liquid obtained by pressing the roots of the 'Ecanda.'

"If the liquid is subjected direct to the action of fire, a skin forms on the surface, like that on boiled milk, consisting of caoutchouc. If this skin is removed in the measure as it forms, its production ceases after some time, and when at length the liquid is completely evaporated, a copious yellow and viscous residue is left.

"By substituting a hot bath for direct fire and proceeding in the manner just described, there also remains a yellow and viscous residue, but it is less copious. In this way I obtained a greater percentage of caoutchouc which was of greater elasticity than that produced by coagulating direct over fire.

"Thus by using heat as the coagulating agent I always obtained beside the caoutchouc a more or less copious residue of a yellow and viscous substance. Now, it is well known, that generally caoutchouc, if subjected to temperatures above 35° C., gradually loses its elasticity, and turns viscous, until at 170° to 180°C. it is converted into a thick liquid much resembling molasses. Therefore, it might be supposed that the residue mentioned above also consisted principally of resinified caoutchouc.

"My suspicion was confirmed when treating the latex by a mixed process of skimming and spontaneous desiccation.*

"By this method I obtained a much higher percentage of rubber and only a small residue, consisting likewise of a yellow and viscous matter. However, the rubber was less elastic than that obtained by coagulation in the hot bath. This is not surprising, seeing that the rubber prepared by the latter process contains all the components of the latex and the root sap (excepting the greater part of the water), and, besides, I had not been able to strain the liquid, having no metal net nor adequate strainer with me.

Processes employed.	Percentage of raw rubber per cent.		Loss by drying per cent.
	Green.	Dry.	
Coagulation over fire	2·90	1·870	35·50
,, in the hot bath	3·54	2·415	33·09
Skimming and spontaneous desiccation	13·00	6·360	51·60

"In order to determine the percentage of pure caoutchouc obtained by these processes, I analysed the samples of 'Ecanda' rubber prepared in Benguela, in the chemical laboratory of the Instituto de Agronomia e Veterinaria, with the following results :—

RUBBER OBTAINED BY COAGULATION IN THE HOT BATH.

Caoutchouc	88·025 per cent.
Resins	4·725 ,,
Substances soluble in water	1·100 ,,
,, ,, in alcohol at boiling point	1·300 ,,
Water	1·082 ,,
Impurities not determined	3·768 ,,

RUBBER OBTAINED BY SKIMMING AND SPONTANEOUS DESICCATION.

Caoutchouc	71·925 per cent.
Resins	3·300 ,,
Substances soluble in water	2·950 ,,
,, ,, in alcohol at boiling point	1·385 ,,
Water	3·154 ,,
Impurities not determined	16·926 ,,

* To extract the rubber by this method I proceeded as follows :—I poured the liquid obtained by the crushing of the 'Ecanda' roots into enamelled iron dishes so as to form a layer 1 cm. thick. After a while in every one of the dishes and adhering to their sides a skin of rubber formed on the surface of the liquid. This skin I removed, and so I went on for two days—the duration of the experiment—new skins continuing to form, but every time less thick. Then the production of skins ceased. But to make sure whether the liquid still contained caoutchouc I left it in the dishes until the evaporation was complete, which was the case five days after the commencement of the experiment. As the dishes were exposed to the air, and the latex somewhat caught the sun, I believe that the little yellow and viscous residue which formed consisted to a small extent of resinified rubber.

"Thus I obtained by coagulation in the hot bath 2·125 per cent. of chemically pure caoutchouc, calculated from the weight of the fresh root, and by the mixed method of skimming and spontaneous desiccation 4·574 per cent. of pure caoutchouc; that is, I obtained by the latter process more than twice the quantity of pure caoutchouc than by the first.

"It follows, therefore, that, of the processes which I tried, it was the process of skimming and spontaneous desiccation by which I obtained the best result. The great drawbacks inherent in that method are, however, aggravated when it is applied to the treatment of a liquid resulting from the crushing of the Ecanda root, and that makes it hardly practicable.

"Indeed, as in this case a much diluted latex has to be dealt with, its coagulation (1) requires, *ipso facto*, much time; (2) implies the use of a great number of recipient vessels; and (3) necessitates a very spacious installation. Moreover, as the latex is not pure, but a mixture of latex and sap, (4) the rubber turns out very impure, the normal constituents of the latex being precipitated together with the substances which were dissolved in the sap of the 'Ecanda' root.

"No doubt points 1–3 could be improved upon by using for skimming and evaporating very porous earthen pans and keeping the liquid at a relatively high temperature; but the disadvantage mentioned under (4) is fundamental . . . Possibly better results will be obtained with chemical coagulents with or without the aid of heating . . . But in my opinion the really practical method of preparing the 'Ecanda' rubber should consist in the centrifugalisation of the liquid obtained by the crushing of the roots. As there was no centrifugal machinery in Benguela I was, to my great regret, unable to try that process."

It would appear that Mr. Geraldes' experiments with 'Ecanda' rubber stimulated some Bihanos (inhabitants of Bihé) to prepare 'Ecanda' rubber themselves, and some of it was actually on the market. Prof. Geraldes describes two of their methods and gives analyses of a sample obtained by one of them:—

"The first method is as follows: They cut the roots into slices, and then expose them on the soil to the action of the sun. In this way the exuding latex is converted into rubber by desiccation and partly also by absorption of its serum through the soil. They thus obtain pieces of a mixture of rubber and soil out of which small cylinders (mutáres) about 12 cm. by 1·5 cm. are made, or small balls which they join in clusters of 4 or 5, and those clusters are also called mutáres (as it were fingers). The mutáres produced in this way have as a rule a good external appearance, but within they contain a great deal of earth which, apart from greatly depreciating the quality of the rubber, has the inconvenience of making them excessively heavy.

"I analysed several samples of mutáres prepared by this method which I brought from Benguela to the Institute.

	Average Composition per cent.
Caoutchouc	45·81
Resins	1·50
Substances soluble in boiling alcohol ...	1·27
Substances soluble in water and impurities ...	51·42

"Samples from the same origin, but previously dissolved in carbon bisulphide and filtered through a cotton filter, gave the following result :—

	Average Composition per cent.
Caoutchouc	92·640
Resin	3·570
Substances soluble in alcohol at boiling point	2·825
Substances soluble in water	0·965

"The other method is still worse. It is as follows : the roots are boiled and then pounded in a mortar. The mass thus obtained is washed out with cold water to eliminate the pulp, and then put in boiling water in order to become workable. Of this mass (which, of course, is still contaminated with a great percentage of pounded vegetable matter) they make mutáres analogous to those described above.

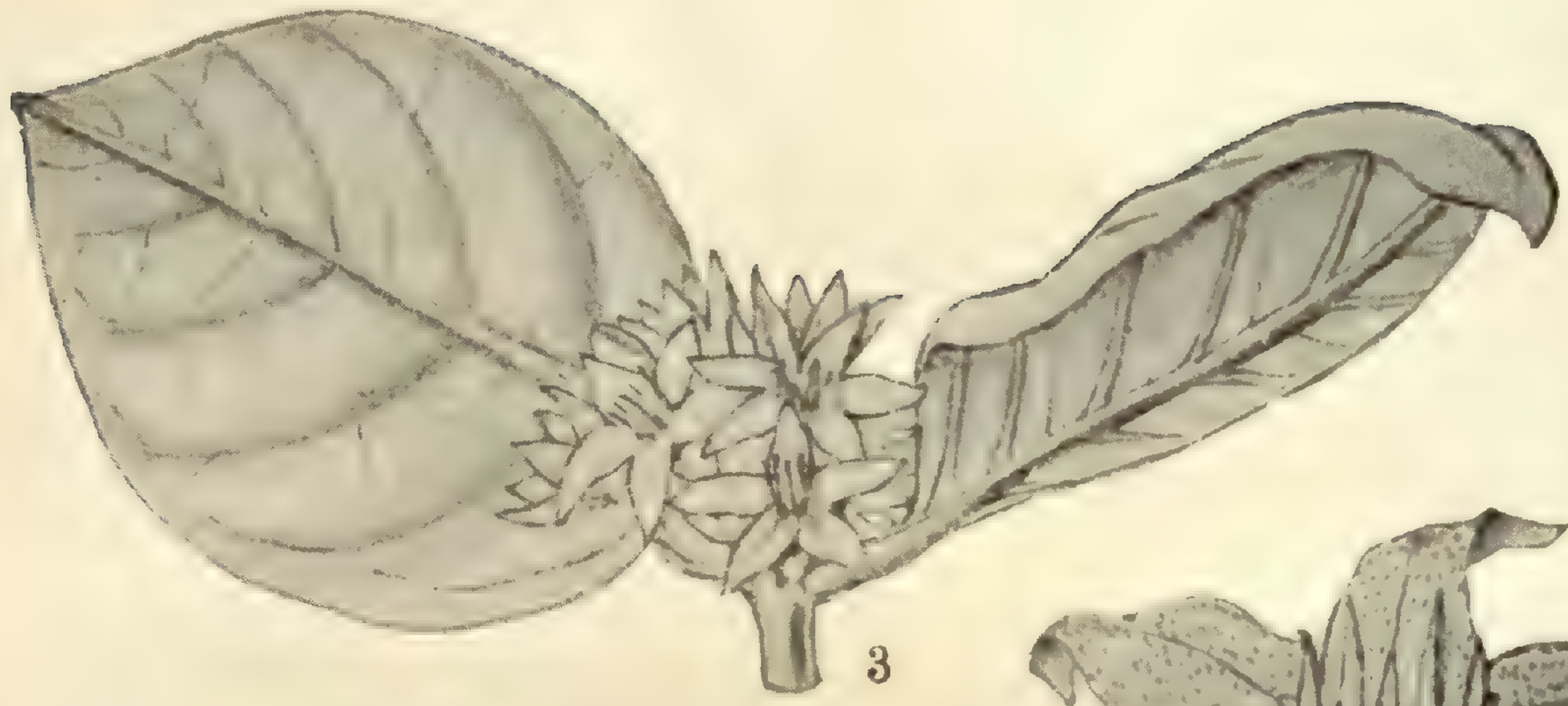
"This process is—as may well be imagined—much worse than the other, considering that the rubber remains contaminated with a great deal of organic matter which easily sets up fermentation and deteriorates the rubber."

Prof. Geraldes also touches the very important point of the rate of growth of the 'Ecanda' tubers. On p. 148 he describes the plants as "biennial (?)," and adds in a foot-note : "one-year old roots which I examined (in the fruiting state) had a diameter of 8-10 cm. (about 3–4 in.), and weighed 200–300 grammes (7-10½ oz.) ; the larger tubers which I saw and which were at least two years old measured 12–14 cm. (4¾–5½ in.) across and weighed 400–600 grammes" (14–21 oz.). There is no evidence that Prof. Geraldes raised plants from seed, for he would no doubt have mentioned the fact had he done so, and his estimate of the age of the tubers measured and weighed rests, apparently, entirely on assumption. *A priori* it appears very improbable that the 'Ecanda' plant should flower in the first year of its growth, or that its tubers should attain the dimensions given above in so short a time. In any case this point demands close examination, as the productiveness of an 'Ecanda' plantation would to a great extent depend on the rate of growth. Prof. Geraldes' calculations of the yield of 'Ecanda' plantations have therefore to be taken *cum grano salis*, and appear in any case far too optimistic. This is what he says on p. 168 :—

"1. If roots one year old are worked, one hectare (nearly 2½ acres) might yield 111,111 'Ecanda' plants, weighing 27,778 kilos (about 27 tons), and producing 125 kilos (nearly 2½ cwt.) of caoutchouc (chemically pure and dry), or a gross return of 312 dols. 500 reis per annum.

"2. If only two year roots are worked, a hectare might yield 83,333 'Ecandas,' weighing 41,666 kilos (about 41 tons), and producing about 200 kilos of caoutchouc (chemically pure and dry), or a gross return of 520 dols. 830 reis per annum."

At present there are about 20 species of *Raphionacme* known, nearly all of them natives of Tropical Africa south of the equator.



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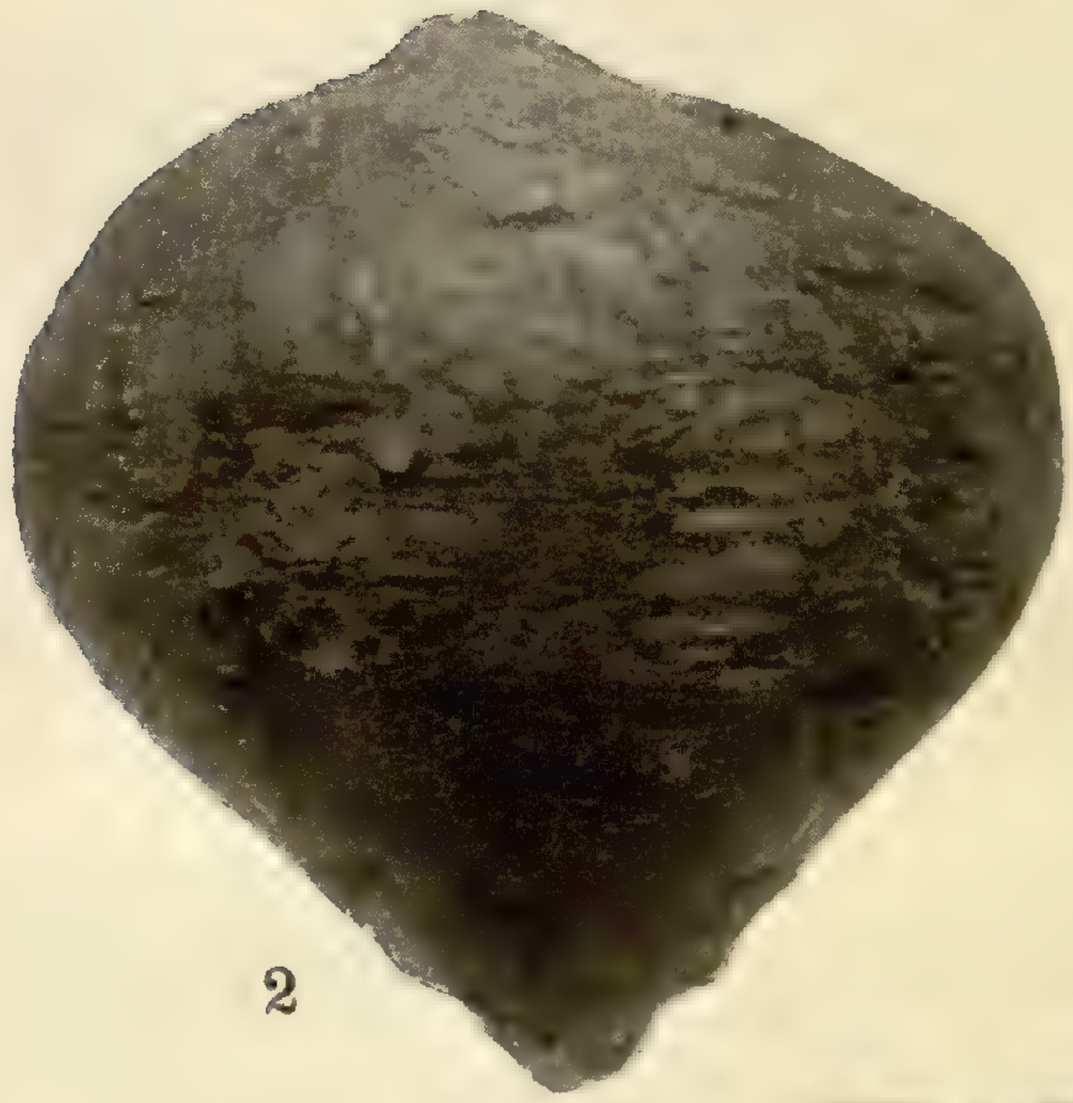

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Raphionacme utilis, *Brown and Stapf.*

To face page 215.

They are all small herbs, from a few centimetres to one metre high, and in many cases are known to possess a tuberous rootstock like that of the 'Ecanda' plant. Five species are recorded from Portuguese West Africa, whilst four occur in Nyasaland, and one each in Bechuanaland (and Rhodesia), the Bahr-el-Ghazal, and in Sierra Leone.

Description.

Raphionacme utilis, *Brown et Stapf*; affinis *R. Welwitschii*, Schlecht. et Rendle, sed planta nana foliis latioribus approximatis rosulatis, corona subbiseriata, *i.e.*, lobis lateralibus contiguis per paria in squamam bifidam connatis et lobum intermedium extus leviter imbricantibus.

A perennial herb with a turnip-shaped tuber, up to 4 in. high and 2–5½ in. in diameter, with a dark brown, scaly bark. Stems solitary, erect, herbaceous, 1–4 in. long, fulvo-puberulous. Leaves in 2–5 pairs, forming in the wild state, according to Geraldes, a rosette close to the ground, spreading, broad-ovate or elliptic to suborbicular, obtuse, apiculate, 1½–2 in. long, 1¼–1¾ in. broad, rounded to subcordate at the base, sparingly puberulous on both sides, green above, bright purple below; petiole ½–⅔ in. long. Flowers in terminal and axillary, sessile, crowded, fulvo-pubescent cymes; pedicels up to ¼ in. long; bracts linear, up to ⅙ in. long. Sepals lanceolate, acute, 1½ lin. long, puberulous, purplish with green tips. Corolla bright purple, about ½ in. in diameter, very deeply 5-fid, lobes very minutely puberulous on the back, glabrous on the face; lobes oblong, subacute with recurved margins. Corona subbiseriate; outer (epipetalous) corona of 5 bifid scales, 1 line long, white with bright purple-tipped teeth, inner (episepalous) corona of 5 subulate, acute lobes, ⅙ in. long, the sides covered at the base by the outer scales, dark purple, much exceeding the stamens. Follicles (Geraldes) broad spindle-shaped, acuminate, up to 4 in. long. Seeds about 50 in each follicle, about 4 mm. long with a coma, 15 mm. long.

Explanation of the Plate.

1. A large tuber, 5½ inches in diameter, with leafy shoots, growing in the Royal Gardens, about half natural size.
2. The 'Ecanda' tuber as imported. Half natural size.
3. An inflorescence produced in the Royal Gardens. Natural size.
4. A single flower. × 3.
5. The details of the corona of the flower. × 6.

Figures 1 and 2 from photographs, 3–5 from photographs of drawings by Miss M. Smith. All the photographs by Mr. C. P. Raffill.

XXVIII.—FUNGI EXOTICI: VIII.

G. Massee.

Of the twelve new fungi here described from material in the Herbarium at Kew, nine have been sent from various tropical colonies, two are from Cape Colony and one from N. W. India.

Agaricaceae.

Volvaria esculenta, *Massee*.

Pileus carnosulus, campanulatus margine striatulo, siccus, levis, griseo-lividus disco obscuriore, glaber, 6 cm. latus. *Lamellae* postice liberae, ventricosae, confertae, albido-carneae, acie albo-fimbriata. *Sporae* ellipsoideae, glabrae, carneae, 6–7 × 4 — 5μ. *Stipes* centralis, subcavus, aequalis, glaber, 5–6 cm. longus, 5 mm. crassus, albidus; volva libera, ampla limbo lobato, pileo concolor.

Tropical Africa. Old Calabar; growing on coffee pulp, *Holland*, 24.

Grows abundantly on heaps of coffee pulp, and is eaten by both natives and Europeans. Allied to *Volvaria volvacea*, Bull., which differs in having adpressed blackish fibrils on the pileus and a solid stem.

Polyporaceae.

Boletus curtipes, *Massee*.

Pileus pulvinato-expansus, sordide brunneus, tomentosus, in aetate profunde reticulato-rimosus margine acuto primum flocculoso, 8–10 cm. diam. *Tubuli* elongati, circa stipitem abbreviati, poris polygonis amplis griseo-luteis. *Stipes* crassus, brevis deorsum incrassatus pileo concolor, sursum subtiliter reticulatus, exannulatus. *Sporae* fusoideae, olivaceo-tinctae, 13–14 × 3·5–4·5 μ.

South Africa. Cape Colony; on the ground, *W. F. Saxton*.

Obviously allied to *Boletus pachypus*, Fr., and *B. edulis*, Fr., and will probably prove to be edible. The first record of the occurrence of the genus *Boletus* in Africa, since *Boletus concretus*, Dur. et Lév., previously recorded from Algeria, proves to belong to the genus *Polyporus*.

Hexagonia Bartlettii, *Massee*.

Pileus repenti-effusus, irregulariter expansus, saepe lobatus margine determinato, non libero, rigidus, tenuiusculus, circa 1 mm. crassus, sordide aurantiacus. *Alveoli* brevissimi, 0·5 mm. prof., ore majusculo, 0·5 mm. diam., penta-hexagono, sat regulari, dissepimentis tenuibus acie acutiuscula, sub lente fimbriatis. *Sporae* ellipticae, hyalinae, 5 × 3 μ.

British Guiana. Georgetown; on dead, fallen branches, Botanic Garden, *A. W. Bartlett*, 8701.

Superficially resembling a species of *Poria*, but distinguished by the large polygonal, shallow pores of the hymenium. Thin, quite inseparable from the matrix, often extending for several

inches in length. Most nearly allied to the resupinate form of *Hexagonia sericea*, Fries, from which the present species differs in the dull orange colour of the hymenium, and the larger and more regular pores.

Daedalea Gollanii, *Massee.*

Pilei orbiculari-dimidiati, coriaceo-rigidi, postice adnato-decurrentes, densissime aggregato-imbricati, 1·5–2 cm. diam. transv. et ant.-post., superne concentrice 3–5-zonati, glabri, ochraceo-carneoli, margine tenui, striatuli. *Hymenium* e poroso lamellosum, lamellulis lacerato-dentatis; postice 5–6 mm. longis, ochraceis. *Sporae* nondum obviae.

INDIA, N.W.P. Mussoorie; on dead wood, Chajuri Garden, 5,600 feet, *Gollan*, 3.

A distinct and interesting species allied to *D. unicolor*, Fries. The numerous closely imbricated pilei form a mass about nine inches long by five inches broad. Very rigid when dry.

LYCOPERDACEAE.

Lycoperdon lignicolum, *Massee.*

Peridia pusilla, sessilia, globulosa, furfuracea, pallida vel straminea, 3–4 mm. lata, subiculo albido effuso enata. *Gleba* gossypina ochraceo-albescens, floccis gracilibus hyalinis, levibus. *Sporae* globosae, hyalinae, scabrae, 3·5–4 μ diam.

SELANGOR. Kuala Lumpur; on dead bark, *Ridley*, 166.

The minute peridia are gregarious on a compact, broadly effused, whitish stroma, in which respect the plant differs widely from all previously described species. *Geaster subiculosus*, Cooke and Massee, resembles the present species in habit and appearance, and might even be mistaken for it before the rupture of the peridium.

EXOBASIDIACEAE.

Exobasidium Fawcettii, *Massee.*

Foliicolum; folia infecta hypertrophica, crassiora, tortuosa, atque saepius bulbosa, violaceo-rubra vel rosea, demum albo-farinulosa. *Basidia* cylindracea, apic e obtuse rotundata, 3–4 sterigmatophora, 55–60 × 7–8 μ. *Sporae* fusoideae vel sigmoideae, hyalinae, continuae, 15–16 × 4–4·5 μ.

WEST INDIES. Jamaica; on living leaves of *Lyonia jamaicensis*, D. Don, *W. Fawcett.*

Allied to *Exobasidium rhododendri*, Cramer, but readily distinguished by the much larger spindle-shaped spores.

UREDINACEAE.

Uredo satyrii, *Massee.* *Maculae* nullae vel vix manifestae. *Acervuli* epiphylli, rarius amphigeni, numerosissimi, gregarii, sordide pallideque ferruginei, epidermide diu velata. *Sporae* globosae vel ovatae, episporio pro ratione tenui undique dense minuteque verruculoso, subhyalinae, 24–27 μ, vel 25–30 × 16–18 μ.

SOUTH AFRICA. Cape Colony ; on living leaves of *Satyrium coriifolium*, Swz., "destroying cultivated specimens," *McOwan*.

Differs from *Uredo orchidis*, Wint., in the spore-clusters not being arranged in irregular concentric rings, and in the colourless spores.

SPHAERIACEAE.

Nectria theobromae, *Massee*.

Perithecia gregaria vel sparsa, superficialia, ovata, levia, glabra, aurantiaco-rubescentia, ostiolo minuto vix prominulo hiante, 0·5 mm., alt. *Asci* cylindracei, stipitati, octospori, paraphyses septatae, ascos excedentes, hyalini, apice vix incrassato, interdum flexuoso, 3μ crasso. *Sporae* oblique monostichae, hyalinae, ellipsoideae, 1-septatae, ad septum subconstrictae, 28–30 × 8–10 μ.

WEST INDIES. Grenada ; "on a 'bleeding' patch of bark of a cacao tree," *Howard*.

This appears to be one of the various species of parasitic fungi that form "bleeding" wounds in the bark of the cacao tree. *Nectria Bainii*, Mass., previously described as forming similar wounds on cacao pods, differs from the present species in having the perithecia shaggy with golden-yellow scale-like hairs.

Phyllachora Dawei, *Massee*.

Stromata epiphylla, superficialia, effuso-crustacea, bullata, atra, rugulosa, 4–7 mm. diam., subglobosa, laxe aggregata vel confluentia, dense loculifera, contextu indistincto. *Loculi* saepe confluentes, difformes. *Asci* cylindracei, apice rotundato, deorsum attenuati, pedicellati, 80–100 × 11–12 μ, octospori, dense paraphysati. *Sporae* obliquae, monostichae, hyalinae, ellipsoideae, utrinque rotundatae, continuae, 21–23 × 9–10 μ.

TROPICAL AFRICA. Buddu, Uganda, 4000 ft. ; on living leaves of *Ficus*, sp., native name "Kokanwe," *Dawe*, 290.

Allied to *Phyllachora repens*, Sacc., differing in the larger, irregularly scattered (not seriate) stromata, which resemble drops of pitch sprinkled over the leaf, and the larger spores.

Dermatea mycophaga, *Massee*.

Ascomata subsessilia, carnosa, aggregata, mox applanata, disco ferrugineo extus glabrato obscuro, 0·5 mm. diam. *Sporae* oblique monostichae, ellipsoideae, hyalinae, glabrae, eguttulatae, 5 × 3 μ. *Paraphyses* filiformes, sursum ramosae, brunneae.

STRAITS SETTLEMENTS. Growing on the stroma of an old *Xylaria*, *Ridley*, 158.

Densely gregarious ; remarkable for the peculiar habitat.

HYPHOMYCETACEAE.

Graphium anomalum, *Massee*.

Stroma verticale, flavidum, siccitate rigidum, 1·5–2 mm. altum, e fibris conglutinatis compositum, hyphis sursum relaxatis pallidioribus conidiiferis. *Conidia*, continua, hyalina, ellipsoidea, 5 × 1·5 μ, conidiophoris lateralibus enata.

Gold Coast. Aburi ; on dead herbaceous stem, *Johnson*, 112.

Stromata fasciculate, departing from the type structure of *Graphium* in having the conidia borne on lateral conidiophores.

Gloeosporium pestis, *Massee*.

Maculae epiphyllae, rarius amphigenae, congestae, nigro-brunneae. *Acervuli* quoque amphigeni, dense gregarii, sub epidermide foliorum nidulantes, pulvinati, demum erumpentes, 150 μ diam. *Conidia* ovato-oblonga, continua, hyalina, basi oblique apiculata, 18–20 × 5 μ.

Fiji. On living Yam leaves, *C. H. Knowles*.

According to the following account, which accompanied the specimens, this parasite threatens to become a serious pest unless promptly arrested. "It is found that not all varieties are attacked ; the ones sent are from the variety which seems most liable to attack. The present season has been an extremely wet one. I have come across it before, but this year it appears to have been much more severe. Last year (the driest on record for 22 years) only very few leaves were seen to be affected."

The entire upper surface of the leaf is often covered with blackish blotches resembling *Gloeosporium musae*, Mass., in habit and general appearance, but differing in the smaller spores.

XXIX.—DIAGNOSES AFRICANAE: XXII.

920. **Heliophila sulcata**, *Conrath* [Cruciferae] ; affinis *H. suavissimae*, Burch., sed caulibus e collo pluricipite pluribus haud vel parce ramosis, foliis plerisque basi congestis longioribus.

Herba perennis, caules 30–40 cm. altos simplices vel subsimplices sulcatos e collo pluricipite emittens, glabra. *Folia* anguste linearia, breviter acuta, pleraque basi congesta, 6–15 cm. longa, 0·5–1 mm. lata, caulina 1–2 breviora. *Racemus* laxus, ad 15 cm. longus ; pedicelli subanthesi erecti, deinde patuli vel penduli, 10–15 mm. longi. *Sepala* anguste oblonga, obtusa, albo-marginata, 4 mm. longa. *Petala* elliptico-oblonga, basi cuneata, 8 mm. longa, purpureo-rosea. *Siliquae* late lineares, marginibus leviter undulatis, utrinque breviter acutatae, 4–5 cm. longae, 3 mm. latae, valvis uninerviis venis delicatis longitudinalibus, stylo 3–4 mm. longo coronatae, pendulae. *Semina* 8–12, 2–2·5 mm. diametro.

Transvaal. Near Johannesburg, *Conrath*. (The same plant was collected by Dr. Bolus in Bester's Vlei, near Harrismith, Orange River Colony, at 5,400 ft., No. 8120.—Otto Stapf.)

921. **Heliophila Woodii**, *Conrath* [Cruciferae] ; affinis *H. divaricatae*, Banks ex DC., sed ramis nullis vel e basi erectis, foliis multo longioribus, floribus roseis duplo majoribus.

Herba annua, glabra, 30–40 cm. alta. *Caulis* erectus, simplex vel basi ramosus, ramis erectis superne angulatis ad vel ultra medium foliatis. *Folia* internodiis longiora, numerosa, linearia, plerumque longe in basin attenuata, 1·5–5 cm. longa, 1–2 mm. lata, accutiuscula.

Racemus laxus, tandem 7–12 cm. longus ; pedicelli 4–10 mm. longi, primo erecti, demum patule recurvi. *Sepala* oblonga, obtusa, 3·5–4 mm. longa, 1–1·5 mm. lata. *Petala* oblongo-elliptica, basi cuneata, roseo-purpurea, 6 mm. longa, 1·5 mm. lata. *Siliquae* anguste lineares, rectae vel subrectae, utrinque breviter attenuatae, pendulae vel patulae, 3·2–4·6 cm. longae, 7·5 mm. latae, valvis uninerviis venis longitudinalibus delicatis nonnullis. *Semina* 15–20, 1·5 mm. longa.

NATAL. In meadows near Durban, *Conrath*, No. 736. [The same species is represented at Kew by the following specimens:—Natal, in grassy places near Durban, Wood, 146 ; Grant, I. ; J. Sanderson, 382 ; "Eastern Province," Bowker, n. 213.—Otto Stapf.)

922. **Polanisia tripyhlla,** *Conrath* [Capparidaceae]; affinis *P. maculata*, Sond., sed differt floribus minoribus, staminibus 6, quorum 4 sterilia filamentis superne sigmatice curvatis, 2 fertilia filamentis rectis.

Herba annua, ad 30 cm. alta, glaberrima, caule erecto supra basin ramis nonnullis virgatis aucto sulcato. *Folia* approximata, petiolata, trifoliolata ; foliola subfiliformia, margine asperula, 8–24 mm. longa, 0·5–0·75 mm. lata ; petiolus 4–14 mm. longus ; folia summa reducta, saepe simplicia. *Racemi* laxi, elongati ; pedicelli tandem ad 8 mm. longi. *Sepala* lanceolata, tenuiter acuminata, 2·5–3 mm. longa. *Petala* 2 longiora oblonga, cuneatim unguiculata, 4–5 mm. longa, rosea, 2 breviora abrupte unguiculata, saturatius rosea, supra unguem utrinque macula citrina ornata. *Stamina* 6 ; 4 petala aequantia, sterilia, filamentis superne sigmatice curvatis et apice incrassatis, caetera paulo longiora, fertilia, filamentis rectis apice haud incrassatis. *Capsula* pendula, linearis, utrinque sensim attenuata, 32–55 mm. longa, 2 mm. lata, nervoso-striata. *Semina* transverse argute-rugosa.

TRANSVAAL. Near Pretoria, *Conrath*, 11.

923. **Pavonia commutata,** *Conrath* [Malvaceae] ; affinis *P. clathratae*, Mast., sed floribus minoribus, epicalyce calyceque brevioribus, carpellis multo minoribus dorso angustis induratis minime alatis distincta.

Herba perennis, basi lignescens. *Caulis* erectus, ramosus, teres uti petioli pedicellique pilis brevibus eglandulosis vel glanduligeris pubescens, praeterea imprimis inferne pilis patulis tenuibus conspersus. *Folia* ambitu cordato-ovata, profunde 5-vel superiora 3-fida, segmento intermedio longiore uti caeteris utrinque 4–2-dentato, 2–4 cm. longa, 3–5 cm. lata, utrinque praecipue in nervis pilosa, subtus pilis nonnullis stellatis additis ; petiolus 3–1 cm. longus ; stipulae filiformes. *Pedicelli* solitarii, petiolum aequantes vel paulo superantes, apice articulati. *Epicalycis* phylla 10–12, subulata, circiter 15 mm. longa, pubescentia pilis glanduligeris intermixtis, longe setoso-ciliata. *Calyx* 5-fidus, segmentis triangulari-ovatis acutis, pubescens, submembranaceus, circa 7 mm. altus. *Petala* epicalycem aequantia, lutescentia, rubro-suffusa. *Carpella* matura 5, 6–7 mm. longa, acute marginata. *Semina* brunnea, 4 mm. longa, subacuta; testa tennuissime punctato-striata.

Transvaal. On hills near Pretoria, *Conrath*, 42.

[To this species are also referable the following specimens in the Kew collection :—Pretoria, J. W. C. Kirk ; Boshveld, Elands river, Rehmann, 4938 ; stony and grassy hills near Potgieters Rust (Pietersburg Distr.), 1140 m., Bolus, 11024.—Otto Stapf.]

924. **Gymnosporia vacciniifolia,** *Conrath* [Celastraceae] ; affinis *G. saxatili*, Conrath (*Celastrus saxatilis*, Burch.) floribus fructibusque multo minoribus distincta.

Frutex divaricatus, ad 1·5 m. altus, ramis teretibus cinereo-fuscis saepe curvatis spinis rectis armatis, ramulis valde abbreviatis. *Folia* in brachycladiis fasciculata, oblonga vel obovato-oblonga, basi cuneata, apice rotundata vel subemarginata, 5–12 mm. longa, 2–3·5 mm. lata, utrinque prominule nervosa, coriacea, glabra, obscure viridia ; petiolus vix ullus. *Cymae* pauciflorae, folia paulo excedentes ; pedicelli 1·5–4 mm. longi, filiformes. *Flores* vix 4 mm. diametro. *Sepala* ovata, obtusa, 0·5 mm. longa. *Petala* ovato-oblonga, alba, roseo-suffusa. *Capsula* 3-loba, depressa, rubra, 2·5–3·5 mm. diametro.

Transvaal. In the bush near Modderfontein, *Conrath*, 88.

925. **Pappea fulva,** *Conrath* ♂ [Sapindaceae] ; affinis *P. capensi*, Eckl. & Zeyh., sed ramis novellis foliisque laxe tomentellis, floribus minoribus, filamentis petala longe superantibus distincta.

Arbuscula 3–4 m. alta,ramis cinereis, novellis fulvo-tomentellis. *Folia* congesta, simplicia, late-oblonga, apice rotundata, interdum subapiculata, basi inaequaliter subtruncata, margine integra vel crenulata vel undulata, ad 6 cm. longa et 2·5 cm. lata, coriacea, subtus fulva, utrinque laxe tomentella, nervis lateralibus utrinque 18–20 cum venarum reticulatione subtus prominentibus ; petiolus 5–10 mm. longus. *Racemi* masculi ad 10·5 cm. longi, 1·2–1·5 cm. lati, graciles, fulvo-pubescentes ; pedicelli 2 mm. longi. *Calyx* 5-fidus, cupularis, pubescens. *Petala* latissime rotundata, 0·5–0·7 mm. longa, basi transverse plicata. *Discus* tomentellus. *Filamenta* 2–2·5 mm. longa. *Antherae* 1 mm. longae. *Ovarii* rudimentum tomentosum.

Transvaal. In bush near Modderfontein, *Conrath*, 295.

[The same plant is represented at Kew by two specimens collected by Rehmann in the Transvaal :—No. 4007, from Aapies Poort near Pretoria (♂) and No. 5460, from Streydpoort in the Makapansbergen (♀). The leaves of Rehmann's No. 4007 are up to 8 cm. long and almost 4 cm. wide with crenulate or acutely serrulate margins. No. 5460 has a foliage exactly like that of Mr. Conrath's plant ; but the stamens are imperfect and almost sessile, whilst the 3-lobed ovary is terminated by a distinct short columnar style. *See* also Mr. J. Burtt-Davy's note on this plant in *Kew. Bull.* 1908, p. 178, under *Pappea capensis.*

G. fulva resembles more *P. ugandensis*, Bak. f., than *P. capensis*, but may be easily distinguished by the long pedicelled (not subsessile) ♂ flowers. It will also have to be compared with *P. Schumanniana*, Schinz, of which there is no specimen at Kew. This is, however, described as having glabrous petals and longer (4 mm.) filaments—Otto Stapf.]

926. **Melolobium subspicatum**, *Conrath* [Leguminosae]; affine *M. Wilmsii*, Harms, sed foliolis obtusis, floribus minoribus, calycis labio infero ad $\frac{1}{2}$ tridentato dentibus angustis distinctum.

Caules lignescentes, ad 35 cm. longi, virgato-ramosi, adpresse pubescentes, deinde glabrati. *Folia* sparsa, parce pubescentia; foliola linearia, ad 20 mm. longa, 1–2 mm. lata, intermedium quam lateralia longius, integra, obtusa; petiolus 5–6 mm. longus. *Racemi* terminales, laxi, ad 10 cm. longi; pedicelli vix ulli, basi bracteati, apice bibracteolati. *Calyx* tubulosus, bilabiatus, 5 mm. longus; labium superum brevius, 2-dentatum, inferum 3-dentatum dentibus elongato-triangularibus obtusiusculis. *Corolla* e calyce breviter exserta; vexillum unguiculatum, exauriculatum, late ellipticum, obtusum, luteum, interdum roseo-suffusum; alae vexillum aequantes, sursum curvatae, oblique ovato-oblongae, tenuiter unguiculatae, obtusae; carinae petala apice cohaerentia, late oblique ovata, rotundato-auriculata, obtusa, quam alae breviora. *Antherae* alternae majores. *Stylus* glaber; stigma capitatum. *Legumen* oblongo-lanceolatum, basin versus attenuatum vel ad medium latissimum, sparse pubescens, 11–14 mm. longum, ad 3 mm. latum.

Transvaal. Irene, *Conrath*, 138.

927. **Lotononis mucronata**, *Conrath* [Leguminosae]; affinis *L. microphyllae*, Harv., foliis longius petiolatis, stipulis majusculis, carina glabra diversa.

Herba basi lignosa, prostrato-adscendens, caulibus ad 35 cm. longis, primo dense adpresse albo-pilosa, deinde glabrata. *Folia* trifoliolata; petiolus foliola aequans vel subbrevior, adpresse albo-pilosus; foliola elliptico-oblonga, acuta, 2–5 mm. longa, primo subtus imprimis ad costam adpresse albo-pilosa, mox glabrata; stipulae solitariae, foliolis similes nisi breviores et angustiores. *Flores* axillares, solitarii; pedicelli albo-pilosi, calyce breviores. *Calyx* turbinato-obconicus, 5–6 mm. longus, parce pilosus, alte inaequaliter 5-fidus, segmentis 4 superioribus per paria altius connatis, omnibus lanceolatis acutis. *Corolla* albida, calyce sesquilongior; vexillum unguiculatum, lamina ovata acuta demum angulo recto patente, in dorso parce pilosula, basi auriculis inflexis instructa; alae oblique oblongae, obtusae, unguiculatae, auriculatae, glabrae, 7 mm. longae; carina recta, alis similis nisi latior, glabra, 8 mm. longa. *Stylus* glaber, incurvatus. *Legumen* oblongum, compressum, in sutura superne et ad styli persistentis basin parce pilosum, caeterum glabrum, 11 mm. longum, 3 mm. latum.

Transvaal.—Modderfontein, *Conrath*, 124.

928. **Lotononis orthorrhiza**, *Conrath* [Leguminosae], affinis *L. tenellae*, E. & Z., sed calycis tubo longiore (4 mm. longus), corolla magis pilosa, legumine calycem aequante praeter suturam glabro.

Herba annua (?), radicibus verticaliter descendentibus ad 5 mm. crassis, caespitosa, caulibus numerosis prostrato-adscendentibus ramosissimis 4–5 cm. longis, fere tota dense patule albo-pilosa. *Folia* trifolioliolata; petiolus gracilis, 4 (raro ad 5) mm. longus; foliola elliptica vel oblongo-lanceolata, acuta, supra glabra, subaequalia, 4–6 mm. longa, 2–2·5 mm. lata; stipulae solitariae, lanceolatae,

foliosae, petiolo duplo breviores. *Flores* axillares, solitarii, breviter pedicellati; bractea linearis. *Calyx* ultra medium 5-fidus, 7 mm. longus, segmentis lanceolatis acute acuminatis, antico angustiore. *Corolla* calycem paulo superans, pilosa, albida; vexillum unguiculatum, lamina e basi subcordata ovata, acutum, 8–9 mm. longum; alae vexillum aequantes, oblongae, obtusae, distincte auriculatae; carina vexillum aequans, oblique ovato-oblonga, obtusa, auriculata, anguste unguiculata. *Ovarium* superne longe-pilosum. *Stylus* longe arcuato-ascendens. *Legumen* calycem aequans, oblique oblongo-ovoideum, subtumidum, praeter suturam pilosam glabrum. *Semina* pluria, funiculo longo.

TRANSVAAL. Modderfontein, *Conrath*, 121.

929. **Lotononis macrosepala**, *Conrath* [Leguminosae]; species distinctissima, quoad sectionem dubia, nisi § *Leptis*, a qua vero distat calycis structura et indumento densissimo argyreo-tomentoso.

Caules plures, e rhizomate repente ascendentes vel erecti, uti tota planta densissime argyreo-tomentosi, 10–15 cm. alti. *Folia* 3-foliolata, internodiis longiora; petiolus 4–10 mm. longus; foliola obovato-oblonga vel oblanceolato-oblonga, subapiculata, ad 3 cm. longa, 0·3–0·8 cm. lata, nervo mediano subtus crassiusculo; stipulae foliaceae, lanceolatae vel elliptico-lanceolatae, acutae, 0·8–1·3 cm. longae. *Flores* solitarii, folio oppositi, brevissime (2 mm.) pedicellati. *Calyx* ultra medium 5-fidus, segmentis subaequalibus lanceolatis acute acuminatis, 11–12 mm. longus, demum paulo auctus. *Corolla* calyce subbrevior, glabra; vexillum ellipticum, acutum, basi in unguem quam lamina dimidio breviorem latiusculum contractum, 10 mm. longum; alae oblique ellipticae, apiculatae, unguiculatae, vix auriculatae, 8 mm. longae; carina oblique elliptico-oblonga, subobtusa, anguste unguiculata, 6 mm. longa. *Ovarium* tomentosum. *Stylus* uncinato-incurvatus. *Legumen* lanceolato-oblongum, ad 2 cm. longum, 0·4–0·5 cm. latum. *Semina* circiter 12, funiculis longis, 1·5 mm. diametro.

TRANSVAAL. Modderfontein, *Conrath*, 133.

930. **Indigofera rostrata**, *Conrath* [Leguminosae]; affinis *I. leptocarpae*, Eckl. & Zeyh., sed foliolis majoribus, racemis longius pedunculatis distincta.

Herba perennis, pluricaulis, caulibus a basi virgato-ramosis sulcatis ut tota planta dense pilis bifurcatis adpressis aspersis. *Folia* pauca, remota, petiolo circiter 3 mm. longo; foliola sublinearia, apiculata, 4–20 mm. longa, 0·5–1 mm. lata, terminale quam lateralia multo longius; stipulae subulatae, 1 mm. longae. *Racemi* pedunculo ad 12 cm. longo suffulti, primo densiflori, deinde elongati, laxi, multiflori; pedicelli circiter 5 mm. longi. *Calyx* oblique turbinatus, 5 mm. longus, alte 5-fidus, segmentis lineari-subulatis, acutis, antico longissimo. *Corolla* 7 mm. longa; vexillum ovatum, acutum, late-unguiculatum; alae vexillo paulo breviores, auriculatae; carina alis brevior, apiculata, exauriculata. *Ovarium* lineare, dense pilosum, pluriovulatum. *Legumen* (immaturum) nutans.

TRANSVAAL. Modderfontein, *Conrath*, 1196.

931. **Rhynchosia remota,** *Conrath* (Leguminosae); affinis *R. pilosae*, Harv., sed indumento copioso, foliorum nervis utrinque 8–9 (haud 5–6), racemis 2–4-floris, floribus 1–0·5 cm. distantibus, pedicellis brevibus distincta.

Caulis 1 m. altus, scandens, teres, dense patule pubescens. *Folia* petiolo ad 3 cm. longo ; foliola ovato-oblonga, minute apiculata, terminale basi rotundatum vel subcordatum, lateralia basi magis minusve obliqua, ad 3·5 cm. longa, 1·5 cm. lata, utrinque pilosa et (imprimis subtus) prominule reticulata ; petiolulus terminalis 5 mm. longus, laterales 1 mm. longi ; stipulae subulatae, 3 mm. longae. *Racemi* axillares, 2–4-flori, 8 cm. longi ; pedicelli filiformes, dense pubescentes, 2–3 mm. longi. *Calyx* 7 mm. longus, patule pilosus, tubo lato 2 mm longo, segmentis caudato-subulatis. *Corolla* ignota. *Legumen* oblongum, subincurvum, patule pilosum, 20 mm. longum, 4·5–5 mm. latum.

Transvaal. Witpoortje, near Johannesburg, *Conrath*, 262.

932. **Heteromorpha involucrata,** *Conrath* (Umbelliferae) ; ab affini *H. arborescente*, Cham. & Schlecht., differt foliis magis dissectis, umbellis diametro majore radiisque numerosioribus, involucro foliaceo.

Herba 50–70 cm. alta, glabra ; caulis pallidus, farctus, superne sulcatus, simplex vel superne parce ramosus. *Folia* glauca, inferiora longe petiolata, ad 7·5 cm. longa, ambitu ovata, 3-partita, segmentis lateralibus alte inaequaliter 2-fidis anguste lanceolatis acutis, segmento terminali alte 3-fido (lobo intermedio saepe alte bilobo) longe decurrente, in marginibus et subtus in nervis aspera, crassiuscula, tenuiter reticulata, superiora breviter petiolata vel sessilia, 2 cm. longa, 3-partita, segmentis lateralibus integris, intermedio 3-fido, summa integra. *Umbellae* terminalis radii 25–35, 2·5–4·5 cm. longi, lateralium pauciores, breviores, omnes angulares ; involucrum phyllis foliaciis alte 2–3-fidis vel integris ad 1·5 cm. longis 2 mm. latis. *Umbellulae* radii 6–18 inaequilongi, 2–5 mm. longi ; involucellum phyllis foliaceis anguste lanceolatis integris 1–3 mm. longis. *Sepala* triangularia, acuta. *Petala* lutea. *Mericarpia* (immatura) ovato-oblonga, stylis divergentibus, stigmate atro-rubro.

Transvaal. Modderfontein, *Conrath*, 328. (The same plant, but with broader leaf-segments, was collected by Dr. Wilms near Pretoria on Rensburg's Farm (no. 563*b*) and near Lydenburg, no. 563.—Otto Stapf.)

933. **Vangueria setosa,** *Conrath* [Rubiaceae] ; affinis *V. macrocalyci*, Sond., a qua foliis lanceolatis parce hispidis, pedicellis longioribus, calycis segmentis angustioribus minoribus differt.

Fruticulus parce ramosus, 6–12 cm. altus, ramis demum glabratis teretibus inermibus. *Folia* subsessilia, pauca versus ramorum apices, oblonga, obtusiuscula vel subacuta, 8–7 cm. longa, 1·2–3 cm. lata, utrinque praecipue in nervis setulosa, setis flavescentibus, rarius subglabra ; stipulae lineari-subulatae, basi in vaginulam connatae. *Cymae* breviter pedunculatae, pluriflorae, 2–2½ cm. longae ; pedicelli setulosi, calyce paulo longiores ; bracteae ovato-oblongae, obtusiusculae. *Receptaculum* dense hispidulum vel subglabrum, 1·5–2 mm. longum. *Calyx* alte 5-fidus, segmentis

lineari-lanceolatis 4–5 mm. longis. *Corolla* viridi-lutescens, 10–11 mm. longa, tubo 4–4½ mm. longo, lobis oblongo-triangularibus caudatis extus hispidulis vel glabris intus praeter basin parce barbatam glabris. *Stylus* antheras aequans ; stigma breviter cylindricum, medio paulo constrictum, sulcatum. *Fructus* depresso-pyriformis, parce puberulus vel glaber, 15–17 mm. diametro.

TRANSVAAL. Modderfontein, *Conrath*, 339. An almost glabrous state occurs along with the typical form.

[This species is also represented at Kew by a specimen collected by Burtt Davy (No. 1475) near Krekemoor Station, Transvaal and another gathered by Holub in the Batlapin Territory, Bechuana Country.—Otto Stapf.]

934. **Helichrysum polyphyllum,** *Conrath* [Compositae] ; affinis *H. cephaloideo* (imprimis var. *polycephalo*), sed foliis brevioribus, capitulis minoribus, involucri bracteis obtusis extus longe pubescentibus differt.

Herba annua, e basi pluricaulis, 20–30 cm. alta ; caules breviter ascendentes, erecti, simplices, usque ad capitulorum glomerulum terminalem dense foliati et uti folia adpresse sericeo-lanati. *Folia* basalia congesta, oblongo-elliptica, lanceolata, 12 mm. longa, 5–6 mm. lata ; caulina quam internodia longiora, oblongo-lanceolata e basi lata semiamplexicauli, subacuta, 10–18 mm. longa, 1·5–2·5 mm. lata, inferiora oblique erecta, superiora adpressa apicibus saepe patulis glabris membranaceis. *Capitulorum* glomerulus circa 10 mm. diametro ; capitula obovoidea, 5–6 mm. longa, phyllis 5-seriatis glabris infimis albo-luteis late oblongo-ovatis obtusis superioribus luteis vel subfuscatis oblongis magis minusve acutis. *Flores* circiter 15, lutei, in receptaculo fimbriato. *Pappi* setae circiter 15, corolla paulo breviores, inferne breviter, superne longius plumosae.

TRANSVAAL. Modderfontein, *Conrath*, 444.

935. **Wahlenbergia subnuda,** *Conrath* [Campanulaceae] ; affinis *W. virgatae*, Engl., sed floribus multo minoribus.

Herba perennis, pluricaulis, ad 25 cm. alta, tota glabra ; caules infra medium et supra iterum furcati, erecti, obtuse angulati, ramis virgatis unifloris. *Folia* remota, squamiformia, triangularia vel lanceolata, integra, 2–3 mm. longa, 1 mm. lata. *Flores* erecti, pedicellis 3–5 cm. longis suffulti. *Receptaculum* elongato-obconicum, 3–3·5 mm. longum. *Sepala* triangularia, obtusiuscula, integra, 2–2·5 mm. longa. *Corolla* late infundibuliformis, ultra medium 5-fida, 5–6 mm. longa. *Antherae* corollae sinus paulo superantes. *Stylus* superne incrassatus et parce puberulus, ad stigmatum bases utrinque glandula notatus, e corolla breviter exsertus. *Capsula* elongato-obconica, 2 locularis.

TRANSVAAL. Modderfontein, *Conrath*, 557.

936. **Manulea limonioides,** *Conrath* ; [Scrophulariaceae], a *M. obovata* differt caulibus glabris glaucis, foliis praeter nonnulla caulina parva late linearia in rosulam congestis, corollae lobis brevioribus latioribus,

Herba perennis e collo crasso. Caules stricti, ad 70 cm. alti, praeter basin pruinosam glabri, glauci. *Folia* basalia, rosulata, oblongo-spatulata in petiolum attenuata, apice integra vel emarginata, 3–6 cm. longa, 0·25–1·2 cm. lata ; caulina pauca, remota, late linearia, 0·6–1 cm. longa. *Flores* in cicinnos geminatos 5–10-floros 1–2 cm. distantes 0·5–1 longos secundum rhachin communem ad 40 cm. longam dispositi, subsessiles, 4–5 cm. longi ; bracteae lineares, calyce breviores. *Calyx* alte divisus, vix 2 mm. longus, segmentis linearibus vel lineari-oblongis obtusis minute parce glanduloso-asperulis. *Corollae* tubus tenuis, 3–5 mm. longus, glaber vel subglaber ; lobi patuli, inaequilongi, oblongi vel ovati, obtusi, ad 1 mm. longi. *Stamina* inclusa. *Capsula* oblonga, apiculata, glabra, 2·5–3 mm. longa, 1·5 mm. lata.

TRANSVAAL. Rietfontein near Johannesburg, *Conrath*, 979.

937. **Loranthus glabriflorus**, *Conrath* [Loranthaceae] ; ab affini *L. prunifolio*, E. Mey., foliis breviter petiolatis, perianthiis glaberrimis distat.

Fruticulus glaberrimus, in *Acacia sp.* parasiticus, ramis fuscis. *Folia* alterna vel opposita, breviter petiolata, oblongo-elliptica, vel oblongo-lanceolata, obtusiuscula, 2·5–3·5 cm. longa, 0·5–1·2 cm. lata, crassiuscula, nervis utrinque prominulis, haud glauca. *Flores* pauci fasciculati, brevissime pedicellati ; bracteae breviter cupuliformes. *Calyx* glaber, quam pedicellus longior ; dentes distincti, rotundati, tubum aequantes. *Perianthium* tubulosum, basi constrictum, medio crassitudine ovarii, rubrum, 4–4·2 cm. longum, ad medium fissum, lobis 5 spatulatis 1·3–1·4 cm. longis canaliculatis. *Antherae* 3·5 mm. longae. *Stylus* corollam paulo superans, sub apice tenui 3 mm. longo ad 6 mm. incrassatus ; stigma rotundato-pyramidatum.

TRANSVAAL. Near Witpoortje, *Conrath*, 331.

938. **Ischaemum Franksae**, *Wood* [Gramineae] ; species distinctissima, nulli arcte affinis, foliis angustissimis, spiculis parium singulorum fere aequalibus, glumis inferioribus exalatis dorso planis ad carinas et in nervis intracarinalibus tuberculatis.

Gramen compacte caespitosum, innovationibus intravaginalibus et culmis floriferis arcte congestis basi vaginis vetustis induratis post ignes persistentibus vestitis. *Culmi* graciles, ad 20 cm. alti, 1–3-nodi, glabri praeter internodium summum sub inflorescentiam albo-vel griseo-pilosum. *Foliorum* vaginae basales lateraliter compressae, carinatae, durae, pilosae, demum glabrescentes, diu persistentes, culmorum laxiusculae, superne angustatae, purpurascentes, pubescentes, praeter summum quam internodia longiores ; ligulae ad lineam pilosam reductae ; laminae setaceo-filiformes, acutae, lateraliter compressae, sectione tranversa semi-oblonga, facie planae vel culmorum subcanaliculatae, innovationum 20 (vel ultra) cm. longae, 0·5–0·75 mm. latae (*i.e.* a latere), laete virides, laeves, glabrae nisi prope basin pilosae. *Racemi* purpurascentes, 2–3, erecti, 2·5–5 cm. longi, breviter pedunculati, pedunculis cinereo-pilosis, pedunculo communi basi barbato et interdum bractea ad 1·5 cm. longa subulata suffulto ; articuli clavato-triquetri, extus albo-pilosi, 4–6 mm. longi. *Spiculae sessiles* oblongo-lanceolatae, acutae, 6–8 mm. longae ; gluma inferior basi albo-barbata,

chartacea, dorso applanata, in carinis et nervis intracarinalibus plerisque tuberculato-aspera, tuberculis carinalibus pilos albos rigidos breves 1 vel 2 gerentibus, nervis a facie visis viridibus carinalibus inclusis 8–9 ; gluma superior navicularis, inferiorem aequans, membranacea, 5-nervis, carinata carina rigide-ciliata, marginibus ciliolatis ; anthoecium inferum ♂, valva oblongo-lanceolata 5–6 mm. longa hyalina purpurascente 3-nervi dorso minute asperula ciliolata, palea 2-nervi hyalina valvam subaequante ; anthoecium superum ♂+, valva apice minute 3-dentata dente intermedio mucronulato, caeterum anthoecio inferiori simile. Antherae 4 mm. longae. *Spiculae pedicellatae* pedicello clavato extus piloso ad 6 mm. longo suffultae, sessilibus similes nisi nervi glumae inferioris intracarinales tantum 3 et valva anthoecii superioris masculi vel hermaphroditi vix tridentata.

NATAL. Tabanhlope, 1800–2400 m., *J. Wylie* (Hb. Wood 10540). This grass has been named after Miss Franks, Assistant in the Government Herbarium, who dissected it and has made all the drawings and dissections in vol. V. of 'Natal Plants,' which volume includes grasses only.

(Mr. Wood's description has been amplified from the excellent material which he was good enough to communicate to Kew. Technically this striking species would come under the section *Eu-ischaemum*, but I have not been able to make out its exact affinities.—Otto Stapf.)

939. **Agrostis suavis**, *Stapf* (Gramineae) ; arcte affinis *A. erianthae*, Hack., sed panicula divaricato-effusa a folio summo remota, ramis 4–5-natis semiverticillatis.

Gramen perenne, laxe caespitosum, innovationibus mixtis, extravaginalibus e basi breviter repente ascendentibus vel in stolones abeuntibus. *Culmi* erecti, ad paniculae basin circiter 50 cm. alti, 3-nodi, glabri, simplices, internodiis exsertis, summo sub anthesi ultra vaginae os 8-12 cm. producto. *Foliorum* vaginae laxiusculae, imprimis superiores, glabrae, laeves, infimae purpurascentes ; ligulae hyalinae, oblongae, ad 5 mm. longae ; laminae anguste lineares, breviter acutae, exsiccando plicatae, ad 15 cm. longae (summae 3·5–4·5 cm. longae), explicatae ad 2 mm. latae, laete virides, glabrae, apicem versus scaberulae, facie inter nervos primarios utrinque circiter 4 fere ad medium angustissime sulcatae. *Panicula* divaricata, laxa, ambitu obovata vel oblonga, ultra 20 cm. longa, ad 15 cm. lata ; rami inferiores semiverticillati, 4–5-ti, superiores 2-ti, plerique ad 2·5–3·5 cm. (nonnulli ad 6 cm.) indivisi, abhinc bis vel ter vel quater geminatim ramulosi, longiores toti 12 cm. longi, filiformes ; inferne laeves, superne asperuli ; pedicelli capillares, terminales ad 18 mm. longi, laterales 3-10 mm. longi. *Spiculae* 4–4·5 mm. longae, stramineae, saepe purpureo-suffusae ; rhachilla ad pilorum fasciculum vix 1 mm. longum redacta. *Glumae* aequales, lanceolatae, acutae, 1-nerves, scariosae. *Valva* a latere visa anguste lanceolata, explanata ovato-lanceolata, 3·5 mm. longa, breviter bifida, 5-nervis, nervis lateralibus in mucronulos excurrentibus, dorso laxe tenuissime pilosa, paulo infra medium aristam setiformem 5-6 mm. longam edens. *Palea* hyalina, 2-nervis, truncata quam valva paulo brevior, glabra.

Antherae non visae. *Caryopsis* lineari-oblonga, circa 1·3 mm. longa, 0·4 mm. lata.

NATAL. *Van Reenen*, 1500–1800 m., *Wood*, 8913.

This differs from *A. eriantha*, Hack., a native of the Transvaal, solely in the habitus of the panicle. Mature specimens of *A. eriantha*, communicated by Messrs. Sutton, have the same narrow contracted panicles as Schlechter's younger flowering type samples of that species and the branches of their panicles are throughout geminate. On the other hand, all of Wood's specimens at Kew (4 sheets) exhibit the habitus described above.

XXX.—MISCELLANEOUS NOTES.

Grey Squirrels—Kew is indebted to His Grace the Duke of Bedford for two pairs of American grey squirrels, which have been placed in the grounds of Queen's Cottage.

Portrait of Dr. James Macfadyen.—The presentation to the Royal Gardens, by Mr. John James Macfadyen, of a portrait in oils of his father, the late Dr. James Macfadyen, forms an interesting addition to the unique collection of portraits of Botanists contained in the Museum No. I. The portrait has been hung near the ascent staircase of the middle floor of the museum. The following Memoir of Dr. Macfadyen, who was a correspondent of the late Sir William Hooker, appeared in the *Proceedings of the Linnean Society of London*, 1851, Vol. 2, p. 135 :—

"James Macfadyen, M.D., was a native of Glasgow, in which city his father was an eminent music-seller. He himself while a student of the University there, destined for the medical profession, distinguished himself by his great love of natural history, more especially in the botanical class, and took his degree of M.D. about the year 1821 or 1822. He was on the point of practising as a physician in his native city, when the late Mr. George Hibbert wrote to request Sir William Hooker to recommend a well-educated botanist, competent to take charge of a garden which the local government in Jamaica contemplated forming at Bath (in that island). Dr. Macfadyen was immediately appointed on Sir William Hooker's recommendation, and established the garden, which unfortunately, owing to the very depressed condition of the colony, was too ill supported to justify his continuing long to superintend it. He consequently gave up the garden and established himself in medical practice, which proved very lucrative. After some years he embarked his savings in the purchase of land and retired from practice. This kind of property, however becoming greatly reduced in value, and having a family to provide for, he was again obliged, scarcely two years ago, to have recourse to his profession for a livelihood. He was most active among all classes of people during the prevalence of the cholera, which has lately so devastated that island, and in the course of his professional labours he took the disorder himself and fell a victim

to it. His kind and benevolent disposition endeared him to a large circle of friends, and his hospitality to strangers, especially naturalists visiting Jamaica, was almost proverbial.

"In 1837 he printed, at Glasgow, and at his own expense, the first volume of his 'Flora of Jamaica,' which extended as far as the end of Leguminosae, following De Candolle's arrangement.

"It described in popular language the then known species of the island, and treated largely on the uses and properties of the native plants. Its limited sale and the arduous duties of his profession retarded the continuation till last year. A great portion of the second volume was actually printed in Jamaica, including a very considerable number of new species, when the further progress of the work was arrested by his sudden decease. He was elected a Fellow of the Linnean Society in the year 1838, and the intelligence of his being chosen a Fellow of the Geological was sent out only a few days before his decease. Besides the 'Flora of Jamaica,' Dr. Macfayden wrote and published in the island an account of the Nelumbium Jamaicense of Patrick Browne, and of the particulars of its rediscovery, nearly a century after Browne had noticed it; and he also published several memoirs relating to the commercial and agricultural welfare of Jamaica."

It will be observed that there is a discrepancy between the foregoing account in reference to the Bath Botanic Garden and that given by Sir Daniel Morris in his account of the "Botanical Institutions of Jamaica," Jamaica Handbook for 1901, pp. 395–400, reprinted in the Kew Bulletin No. 3, 1906, p. 61. According to Sir D. Morris the Bath Garden was established in 1779, and appears to have flourished until 1810. From this time onwards, owing to the "influence of domestic trouble, want of due appreciation of the value and nature of Botanic Gardens, or the need of strict economy," the garden fell upon evil days, but was, however, maintained in a very reduced state until 1824, when a Committee was formed to inquire into the state of the Botanic Gardens, and as a result of its deliberations it was decided to engage a botanist to work up the vegetable economic resources of the island, and the appointment was made of Dr. Macfayden, who arrived in the island in 1825.

At the same time it was felt that the Botanic Garden at Bath was too distant from Kingston and the seat of Government to answer the intention proposed, and it was recommended that a Bill be brought in for the purchase of a proper place for a garden in the vicinity of Kingston and Spanish Town. This appears to have been the garden that Dr. Macfayden was to have formed; the proposal, however, was not carried into execution.

Dr. Macfayden was born in Glasgow in 1800, and died at Jamaica in 1850.

Presentations to Museums.—An interesting old plan of the Botanic Gardens, Kew, from the Rev. F. J. Dickinson, Wentworth Rectory, Isle of Ely.

Specimens of *Odontopus sexpunctulatus*, an insect which pollinates *Welwitschia mirabilis*. From Prof. H. H. W. Pearson, M.A., F.L.S., South African College, Cape Town.

Portrait of Lord de Tabley as a young man. Presented by the Hon. Lady Leighton Warren, Tabley House, Knutsford.

Stem of a giant sunflower, and specimens of deformed roots of a pear tree grown at Kew. From Mr. Pitt, Kew Green.

Samples of Raphia wax and fibre from Madagascar. From the Editor, British Trade Journal.

1. *Polystictus sanguineus*. 2. Stems of *Lapageria rosea* twisted into rings; also used for basket-making. Temuco, Chili, from Mr. R. M. Middleton, F.L.S., Kew.

West African Mahogany. Eight small samples, from Mr. James A. Weale, Bootle, Liverpool.

Bamboo joint from a correspondent in Japan showing the manner in which the Japanese use the Bamboo as a natural mailing-case. Presented by Mr. C. G. Lloyd, Cincinnati, Ohio, U.S.A.

Rough and finished hay forks of the wood of "Micocoulier" (*Celtis australis*), from the Riviera. The tree is cultivated for the purpose of making forks in this part of France, being pollarded and trained to the shape required. The wood is also much used for whip-handles and the fruit is eaten by the country people. These specimens were presented by Mr. Kyllmann of Antibes at the suggestion of Mr. J. F. Duthie, F.L.S.

J. M. H.

Triumfetta cordifolia.—Numerous African specimens of fibre-yielding species of *Triumfetta* having been received recently for identification, it became necessary to re-examine the African material which had been referred to *T. cordifolia* and *T. semitriloba*, and the results are now given.

T. cordifolia was described in 1831 by A. Richard in Guillemin and Perrottet's *Flora of Senegambia*, p. 91, t. 18, from specimens collected in "palm woods" at Cape Verde. With the exception of a brief note in Hooker's Niger Flora, p. 236, there is no further reference to *T. cordifolia* until 1868, when it was reduced by Masters (*Fl. Trop. Afr.*, vol i., p. 257) to *T. semitriloba*, Jacq., which differs from *T. cordifolia*, however, in the *retrorsely pilose* prickles of the capsule (*see DC. Prodr.*, vol. i., p. 507; *Mart. Fl. Bras.*, vol xii., part iii., p. 135), a character of great importance in the genus *Triumfetta*. Masters's reduction was accepted by nearly all subsequent writers, including Hiern (*Cat. Afr. Pl. Welw.*, vol. i., p. 97), Schumann (*Engl. Pfl. Ost-Afr.*, vol C, p. 264), and De Wildeman (*Ann. Mus. Congo*, sér. 5, vol. i., p. 56); Schumann, however, separated the African material of *T. semitriloba* as a new variety *africana*, based on differences of foliage and inflorescence, and suggested that it might perhaps be better to treat it as a distinct species.

Williams adopted the name *T. cordifolia* in his *Florula Gambica* (*Bull. Herb. Boiss.*, sér. 2, vol. vii., 1907, p. 201), on the authority of a "note by Planchon in Herb. Kew, as to its being quite distinct from *T. semitriloba*," and without mentioning any distinguishing characters. This note, however, has not been found, although two sheets in the Kew Herbarium (Gambia, *Capt. Boteler*; Sierra Leone, *Mann*, 869) are named *T. cordifolia* by Planchon, who points out that the stamens of Capt. Boteler's plant are 10 in number as in the plate of *T. cordifolia*, instead of 25 as in the description. Further discrepancies between text and plate are that the petals are described as being slightly longer than the sepals and the capsule as glabrous, whereas the petals are figured as considerably shorter than the sepals and the fruit as hirsute. The Kew material agrees with the plate as regards the petals and stamens, whilst the fruits are hairy on some specimens and glabrous on others. In what follows, *T. cordifolia* means the species figured in the *Flora of Senegambia*, not the one described. It seems probable that the material examined by Richard consisted of a mixture of two distinct species.

T. cordifolia as defined above, appears to be a polymorphic species, exhibiting considerable variation in the indumentum of the stem, leaves, flower and fruit, and in the lobing and serration of the leaves; and both pentamerous and hexamerous flowers may be found on the same inflorescence. Three well-marked varieties may be distinguished, however, which, but for the existence of a few intermediates, might almost be regarded as distinct species. Typical *T. cordifolia* is characterized by unlobed leaves and by a sparse indumentum consisting mainly of small stellate hairs; variety *Hollandii* by unlobed or three-lobed leaves, and by the presence on stem, leaves and flower-buds of numerous, long, simple hairs in addition to small stellate ones; and variety *tomentosa* by three-lobed or almost five-lobed leaves, clothed with a fine dense stellate tomentum. The type occurs from Senegambia to the Cameroons; var. *Hollandii* from the Gold Coast to Nigeria and Fernando Po; and var. *tomentosa* in the Cameroons and Angola. This distribution would seem to indicate that var. *Hollandii* and var. *tomentosa* are geographical races, but further material is required, from different localities, and representing all stages in the development of the plant, before the point can be decided. The following conspectus of the varieties and forms is to be regarded, therefore, as provisional :—

TRIUMFETTA CORDIFOLIA, Guill. et Perr. Fl. Seneg., t. 18 (1831), *sensu amplif.*, non descr. *T. semitriloba*, Mast. in Fl. Trop. Afr., vol. i., p. 256, non Jacq. *T. semitriloba*, var. *africana*, K. Schum. in Engl. Pfl. Ost-Afr., vol. C., p. 264.

Var. α. TYPICA, Sprague, foliis indivisis, indumento sparso e pilis parvis stellatis plerumque constante.—*T. cordifolia*, Guill. et Perr. *l.c.*, *sensu restrict.*; F. N. Williams in Bull. Herb. Boiss., sér. 2, vol. vii., p. 201; Stapf in Johnston, Liberia, vol. ii., p. 583. *T. angulata*, Hook. f. in Niger Fl., p. 235.

Forma 1. PILOSA, Sprague, aculeis capsulae pilosis. Senegambia, *Heudelot*, 629. Gambia, *Ingram*, *Boteler*. Sierra

Leone, *Dudgeon*, 5½, 6b, 7a, 7b. Bagru River, *Mann*, 869; very common on open places near Sierra Leone, *Scott Elliot*, 4163; in woods on the way to Lester Peak, *Scott Elliot*, 3899. Liberia, within six miles of Monrovia, *Whyte*. Lagos, *Rowland*. Cameroons, *Preuss*, 1356 (distributed as *T. semitriloba*, var. *kamerunensis*, K. Schum.).

Forma 2. LEIACANTHA, Sprague, aculeis capsulae glabris. Sierra Leone, *Taylor* (*Cole*), E.

Variety *typica* (both forms) is used as a fibre plant in Sierra Leone under the name 'Raka' (Racca).

Var. β. HOLLANDII, Sprague, foliis indivisis vel trilobis, ut caulibus et alabastris non solum minute stellato-pilosis sed etiam pilis longis simplicibus ± hirsutis.

Forma 1. INDIVISA, Sprague, foliis indivisis. Lagos, *Barter*, 20.86; Epe, Millen, 5. S. Nigeria, Okimi, *Holland*, 170; Oloke Meji, *Foster*, 363. Gold Coast, near Axim, *Cort Development Syndicate*.

Forma 2. SUBTRILOBA, Sprague, foliis subtrilobis pilis simplicibus interdum minus obviis. Gold Cost, near Axim, *Cort Development Syndicate*. Fernando Po, *Barter*.

Variety *Hollandii* is used as a fibre plant in Lagos under the name 'Esura.' It resembles *T. pilosa*, Roth, in habit, but may be distinguished by the less leafy inflorescence, the indumentum and less obvious mucros of the flower buds and the fewer and shorter prickles of the capsule.

Var. γ. TOMENTOSA, Sprague, foliis trilobis vel subquinquelobis, indumento denso e pilis minutis stellatis constante.—*T. semitriloba*, Hiern, Cat. Afr. Pl. Welw., vol i., p. 97, non Jacq.

Cameroons, Yaunde, *Zenker & Staudt*, 63; *Zenker*, 676; Bipinde, *Zenker*, 1195 (distributed as *T. semitriloba*, var. *africana*, K. Schum.). Angola, district of Golungo Alto, very common in dampish thickets, at the banks of the river Cuango, *Welwitsch*, 1428; cultivated specimen raised at Kew from seed collected by *Monteiro*.

The following specimens seem referable to var. *tomentosa*, though their indumentum is looser and coarser:—Angola, Golungo Alto, frequent in the primitive woods of Sob. de Mussengue, *Welwitsch*, 1427; without precise locality, *Welwitsch*, 4648.

Variety *tomentosa* is known in Angola under the native name 'Quibosa,' and ropes, sacks, &c., are made from the fibre of its stem.

Triumfetta semitriloba, Henriques, in Bull. Soc. Broter., vol. xvi., 1899, p. 58, described as a shrub found in valleys and inundated ground between the rivers Luachimo and Quihumbo, Angola, and known by the native name 'M'pum' (*Marques*, 327) is probably referable to *T. cordifolia*, var. *tomentosa*. *T. semitriloba*, Henriques, *l.c.*, x., 1892, p. 104 (St. Thomas, *Moller*), is *T. rhomboidea*, Jacq.

There remain a few specimens which are intermediate in character. *Irving*, 76, from Abeokuta, Lagos, has flower-buds hirsute with simple hairs, like var. *Hollandii*, but the indumentum of stem and leaves is that of var. *typica* ; and *Johnson*, 476, from the Aburi Hills, Gold Coast Colony, is intermediate between var. *Hollandii* and var. *tomentosa* ; as is also *Bates*, 79, from Batanga, Cameroons.

The question naturally arises whether some at least of the intermediate forms may not be the result of hybridisation, but this can only be solved by the study of the living plants in their natural habitat, accompanied by the preparation of a complete series of specimens illustrating all stages of development.—T. A. S.

Botanical Magazine for May.—The plants figured are *Tillandsia Blokii*, Hort., × *Philadelphus purpureo-maculatus*, Lemoine, *Puya violacea*, Mez, *Liparis tabularis*, Rolfe and *Prunus tomentosa*, Thunb. The material from which the *Tillandsia* was figured was supplied by Mr. F. W. Moore, of the Royal Botanic Garden, Glasnevin. The species is South American, but its exact country of origin is not recorded and altogether very little is known of its history. It is a tall-growing shrub, reaching a height of 6 feet, and flowers only once during its life which may cover a period of 20 years. The *Philadelphus* is a garden hybrid raised by Messrs. Lemoine of Nancy from seeds of *P. Lemoinei*, a hybrid of which *P. boulteri*, S. Wats. is one of the parents. The rather large flowers have white petals with a bright purple-red base, a colour which is absent in all the other hardy species or hybrids in cultivation. A plant from which the drawing was prepared was purchased from Messrs. James Veitch & Sons in 1905. The handsome *Puya violacea* is a Chilian species which has been in cultivation in Europe since 1833. Its bright, deep violet flowers are rarely produced, and it was not till the year 1847 that they appeared on a cultivated plant. That now figured was presented to Kew by the late Mr. J. Anderson Henry, of Edinburgh, in 1879. It flowered in the Mexican House in June last year. *Liparis tabularis* is a somewhat ornamental Orchid with large sheathing leaves and large reddish purple flowers, and is a native of Penang. It flowered in April, 1906, in the collection of Mr. H. T. Pitt, of Stamford Hill, by whom a plant was presented to Kew. *Prunus tomentosa* is a dwarf-growing species native of the mountains of Northern and Western China and, according to Bretschneider, cultivated at Peking for its edible, cherry-like fruits. It has long been in cultivation at Kew, but only occasionally ripens a few fruits. It is, however, a very attractive early-flowering shrub.

'Biak'; an Opium Substitute.—In the *Kew Bulletin*, 1907, p. 199, there is a short note on "Anti-opium plants." Under this heading *Mitragyne speciosa*, Korth., is referred to, as well as *Combretum sundaicum*, Miq. The *Mitragyne*, however, is used not as a remedy but as a substitute for opium (Ridley, 'Malay

Plant Names,' in *Journ. R. As. Soc., Straits Branch*, 1897, p. 58' "Biak (Perak), *Mitragyne speciosa*, Korth. (Rubiaceae). Leaves used as a substitute for opium in Perak, according to Mr. Wray."). Attention was drawn to *Mitragyne speciosa* by Hooper in a communication to the *Pharmaceutical Journal*, vol. 78, 1907, p. 453, where it is inadvertently stated that the leaves of this plant are used as a remedy for the opium habit, and in consequence *Mitragyne* was included as an 'anti-opium' plant.

In the *Journal of the Federated Malay States Museums*, vol. II., No. 2, Dec. 1907, Mr. Wray calls attention to the mistake, and gives an account of 'Biak' (*Mitragyne speciosa*). The leaves of this indigenous tree are sometimes used in Malaya as an opium substitute. In Perak its use appears to have declined recently owing to the introduction of cheap opium, but in Patani and other northern States it is reported to be much in vogue.

The tree is known as 'Poko Biak' in Perak and as 'Keton' in Patani. Its geographical range embraces the whole Malayan archipelago and peninsula, and it is widely distributed in Perak. It occurs in the jungle and is planted in the kampongs, and is frequently seen in and around villages.

According to Mr. Wray the drug is prepared for use in one of two ways. "In the first the leaves are picked and put out to dry in the sun until they become crisp, when they are reduced to powder by rubbing between the hands, the fibrous ribs and veins of the leaves being removed during the process. The resulting powder may then be stored for future use . . .

"The dose would be 136 grains, or, say, $2\frac{1}{4}$ drams apothecary's weight. The powder is mixed with cold water in a cup and the whole drunk, or an infusion is made with hot water and it is taken like tea. It is usual to take it twice a day, before meals.

"The second method of preparation is to dry the leaves as before in the sun, then boil them in water so as to form an infusion. This is strained and the clear filtrate is evaporated to a sirupy consistency. This extract can be kept a long time, and is usually stored in the little horn boxes used by opium smokers for keeping prepared opium in. It is called *chandu* by the Malays, which is also the name of opium when prepared for smoking. This extract of *biak* is mixed with hot water before taking. The dose is said to be one *hun*, which is equal to 5·83 grains troy. Some people just put it on the tongue and wash it down with a drink of water.

"The extract may also be smoked, somewhat in the same way as prepared opium. The pipe employed for this purpose is made of the bamboo known to the Malays as *buloh minyak* (*Oxytenanthera sinuata*), and is $14\frac{1}{2}$ inches long and $\frac{7}{8}$ inch in diameter. It is closed by a natural septum at one end and is open at the other; this is the end which is applied to the mouth in use. Near the closed end a brass tube is inserted, which projects at right angles to the bamboo and is $1\frac{3}{8}$ inches long, with a bore of $\frac{1}{4}$ inch in diameter. There is in the Museum collection an opium pipe of Patani pattern, almost exactly similar to the one described above, only the bowl, if it may be so called, is of tin in place of brass.

The extract is prepared for smoking by mixing it intimately with the finely shredded leaves of the *Palas* palm (*Licuala paludosa*), cut in the same way, and with the same implements, as native-grown tobacco. This mixture, which is a sticky, fibrous, brown mass, is called *madat*.

"A lamp on a tall foot completes the outfit. A specimen in the Perak Museum has a wooden base in the form of a conventionalized four-lobed flower, of $5\frac{1}{2}$ inches square and $1\frac{1}{2}$ inches thick. The upper part consists of a piece of bamboo $2\frac{5}{8}$ inches in diameter, cut so that the upper portion forms a shallow cup, closed beneath by a septum. Below this the greater part of the walls of the bamboo have been cut away, leaving only four equidistant cylindrical-shaped pieces, the lower ends of which are mortised into the wooden base, the whole being 9 inches in height. The cup serves to hold the oil container, which is a valve of a fluvio-marine shell. The wick is of twisted cotton cloth, kept in place by a metal support. Coconut oil is burned in it.

"The method of smoking is as follows: The smoker sits tailor-wise on the floor, with the lamp in front of him. He then takes a small piece of the *madat*, rolls it with his fingers into a pellet the size of the bore of the brass tube, into which he inserts it, then putting his mouth to the other end of the bamboo he brings the *madat* in contact with the flame of the lamp and inhales the smoke of the burning pellet through the pipe. From twenty to thirty pellets are smoked at a time.

"The effects of the drug, whether taken internally or smoked, are said to resemble those of opium, and in large doses it is poisonous, producing stupor. It is also said that users of it suffer from permanent enlargement of the abdomen. This is attributed, by some, to the indolent life which is induced by indulgence in the *biak* habit."

Up to the present time no poisonous alkaloid has been found in the plant, but the matter is still under investigation.

The Malayan Anti-Opium Plant (*Combretum sundaicum*, Miq.).—In the *Kew Bulletin*, 1907, p. 198, reference was made to the discovery of a plant in Malaya, which was reputed to be valuable for the purpose of destroying the desire for opium. The plant has been identified by Mr. Carruthers as *Combretum sundaicum*, Miq., a native of the Malayan peninsula and archipelago. The history of the discovery of the value of the plant is given by Mr. Wray in the *Journal of the Federated Malay States Museums*, vol. II., No. I., December, 1906, and is as follows:—

"A party of Chinese wood-cutters working in the jungle near Seremban in Negri Sembilan, ran out of tea, and to supply its place took the leaves of a jungle climber, dried them and made an infusion in the ordinary way. This, however, was not successful, as the beverage made the men ill with 'sakit pĕrut' (*i.e.*, bowel complaint). The leaves were then roasted and a fair substitute for tea was obtained, which had no ill effects. Then, for some obscure reason, 'tengo,' opium dross, or the refuse opium after being smoked, was mixed with it, and the men continued drinking

the mixture for a week or more in place of tea. After this time it was found that all desire for opium smoking had been lost. Friends of the men were told of the discovery, and so the news was spread and others were induced to try the remedy."

With regard to the further history of the plant and the spread of the knowledge of its properties, Mr. J. G. Alexander has been kind enough to furnish us with the following particulars :—

The young men of the Chinese Y.M.C.A., connected with the church of the Rev. W. E. Horley, of the Methodist Episcopal Church, Kuala Lumpur, heard that in the village of Jelebu in the neighbouring State of Negri Sembilan, a cure for the opium habit had been found, namely, a decoction of the leaves of a forest creeper (*Combretum sundaicum*) which grows abundantly in the tropical jungle. They brought the matter before Mr. Horley as they purposed to devote their leisure to the distribution of the medicine if he would afford them the necessary help. He obtained help from the Anti-Opium Society of Selangor, who undertook to pay all expenses on condition that the medicine was distributed without charge.

In a few weeks the news of the cure spread quickly and after some four weeks, 500 applicants daily were supplied.

An applicant brought with him two bottles, old brandy or whisky bottles which were filled with the decoction and into one of the two he placed—if beginning the cure—his usual quantity of opium dross; this is not repeated, and he fills up the bottle containing it from the other bottle which contains none so that gradually the proportion of opium is reduced to nil. If he came a second time no opium was used.

The somewhat crude method of preparation of the drug is given in detail by Mr. Wray in the article to which reference has already been made. With regard to its chemical nature nothing has as yet been discovered either in the leaves or stem of the plant or in the decoction of the roasted drug which would account for its physiological value.

Medical men seem to be strongly inclined to the view that the plant has no real value and that it is the effect on the mind of the opium consumer which helps him to overcome the opium habit.

In favour of this latter view it appears that in Malaya many of those who were or appeared to be cured have relapsed into the habit, though on the other hand many are still holding their ground after more than a year.

In the *Agricultural Bulletin of the Straits*, vol. vi., p. 46, Mr. Ridley states that at least three kinds of plants were included in the samples of the anti-opium plant received by him from different people, one of them being the *Combretum*, so that until more definite evidence of the value of the anti-opium plant is forthcoming it seems advisable to preserve an open mind on the subject.

1. Tussock Grass—*Poa litorosa*.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6.] [1908.

XXXI.—THE SOUTHERN ISLANDS EXPEDITION.

The expedition, undertaken by New Zealand scientists, to the Auckland and Campbell Islands, which left New Zealand on November 14th, 1907, returned in safety at the beginning of December. It was carried out by the Government, with the advice of the Council of the Canterbury Philosophic Society, and appears to have met with considerable success, as will be seen from the following accounts :—

DR. L. COCKAYNE, Naturalist of the Expedition, communicated an account of the Islands to "The Lyttelton Times," of November 6th, 1907, part of which is here reproduced.

"Rising out of that vast expanse of stormy ocean which surrounds the iceclad Antarctic continent are several small groups of islands, tiny specks indeed upon the map. The principal of these—the Falklands, South Georgia, the Crozets, Kerguelen Land and the southern islands of New Zealand—though at most mere names to the majority, are of surprising interest to the scientific, presenting as they do many problems for elucidation, full of fascination but of extreme difficulty. Of greater extent, but having many biological features in common with the above, are Tierra del Fuego and South America west of the Andes as far north as and including the Chronos Archipelago.

"Now, although in the Northern Hemisphere, a fairly abundant vegetation of flowering plants exists beyond the Arctic Circle, the Antarctic is practically without plant-life except seaweeds and a few mosses and lichens; the above-mentioned islands, though lying for the most part at the same distance from the equator as Great Britain, marking, with a few trifling exceptions, the southern limit of the higher plants. Still more remarkable is it that, though separated from one another by thousands of miles of ocean, they have no small number of species in common. The earthworms of our southern islands are closely related to those of Kerguelen Land and Fuegia; the wet coastal rocks of Antipodes

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and Marion Islands are equally adorned with the succulent, reddish masses of *Crassula moschata*, and the tender green feathery-leaved *Cotula plumosa* equally delights the eye both on the Crozets and the Aucklands, while the huge cushions of that remarkable plant of the carrot family, *Azorella Selago*, defy the constant Antarctic gales of both Kerguelen Land and the Macquaries. Until quite recently it has been the habit to speak of the fauna and flora of the above islands as Antarctic, but this quite evident misnomer has recently been changed to subantarctic, since their biological conditions have nothing analogous with those of the Arctic, and also are very different to what is found at similar latitudes in the Northern Hemisphere. So far as the New Zealand subantarctic region is concerned, there are six groups of islands, of which the Aucklands are by far the largest. The following are their names, distances and direction from the South Cape of Stewart Island :—

"The Snares, sixty miles S.W.; the Aucklands, 190 miles S. by W.; the Campbells, 330 miles S. by E.; the Antipodes, 490 miles E.S.E.; the Bounty Islands, 490 miles E.; and the Macquaries, 570 miles S.W. by S. These latter have an anomalous position, as they belong politically to Tasmania, but biologically to New Zealand.

"It was trade and not science which first made these remote portions of our dominions famous. Where the waves break over the jagged rocks was a countless host of fur seals, now, alas! all but extinct. For years small sailing craft, manned frequently by Stewart Island Maoris, visited their shores, riding secure in the fine harbours of Auckland or Campbell Island, or landing parties on the shining granite rocks of the Bounties or the tussock-clad Antipodes. The havoc wrought amongst the seals was almost incredible; for instance, the story goes that one ship alone landed 100,000 skins at the Antipodes. A quite remarkable incident in the history of the Aucklands was the Enderby Settlement, a grant of the islands being made to Messrs. Enderby, who established what was known as the Southern Whale Fishery Company. For some years, 1850–1852, a population of 300 Europeans and Maoris lived at the north end of the main island and on Enderby Island, braving the inhospitable climate, but, as the venture was a financial failure, the settlement, from which great things were expected, was abandoned.

"With the decline of whaling and sealing, the non-scientific interest in the islands would have ceased, had it not been for the fact that their iron coasts lay right in the track of sailing vessels by the Cape Horn route to Europe. Consequently, as might well be expected, many shipwrecks have taken place, the barren shores and fantastic forests being silent witnesses of frightful sufferings and no little splendid heroism. One example alone can be here briefly touched on. The Grafton, a small sailing vessel of seventy-five tons, was wrecked in the land-locked Carnley Harbour. Officers and crew, five in all, landed safely and lived at the south end of Auckland Island for a year and a half. Finally, however, seeing no hope of escape from a most miserable life, the ship's dinghey was mended, with what makeshift tools they possessed, and in this most crazy craft Musgrave, the

captain, Raynal, the mate, and one of the crew started out on what must have looked the most hopeless of forlorn hopes to brave the tempestuous two hundred miles of heaving waters separating them from Stewart Island, which place, marvellous to relate, they gained in safety. This most daring need roused the enthusiasm of Invercargill, whose people equipped the Flying Scud and rescued the two sailors left behind.

"The case of Musgrave and his crew aroused the public from its apathy, so that first the Victorian Government steamer visited the islands in 1865, while three years later the brig Amhurst examined all our southern islands for castaways. Later on, the New Zealand Government erected huts and boatsheds, providing abundance of food, clothing and bedding in the former and a boat in each of the latter. Each year, too, one or more trips are made by the Hinemoa, the Tutanekai, or a man-of-war to the islands, and more than once the first-named vessel has returned with rescued mariners."

CAPT. DORRIEN SMITH who was a member of the Southern Islands expedition has kindly permitted his Report to appear in the *Bulletin* and has also supplied the photographs from which the illustrations have been taken.

"The Lord Auckland Islands. Lat. 49.50 S.
"Nov. 26th, 1907. Long. 66.01 E.

"As a member of the Sub-antarctic Scientific Expedition, I left the Bluff, N.Z., with some two dozen other members, at 8·50 a.m. on November 14th, 1907. The Expedition which originated with the Canterbury Philosophic Society, a branch of the New Zealand Institute, was divided into two parties, half the members going to the Auckland Islands, the other half to the Campbell Islands. The primary object of the expedition was magnetic observation, in both groups of Islands. The other scientific branches included Botany, Geology and Zoology. The Government S.S. Hinemoa, Commander Captain Bellons, conveyed the party. At 2 p.m., 14.11.07, put in at Port Pegasus, near the S.W. extremity of Stewart Is. The whole party proceeded ashore, or in pursuit of fish. The harbour is very fine, and perfectly land-locked and a good anchorage. There are only a few rough shanties, and a fish-freezing works ashore, the place being used chiefly in the winter for fishing. A track through the bush leads across the island to Paterson's Inlet. The island is very rugged and covered with dense bush comprised of *Metrosideros lucida*, which is dominant and exceedingly gnarled and straggling. *Podocarpus Hallii*, *Dacrydium cupressum* and *D. intermedium* are very prominent, whilst *Panax simplex*, *Leptospermum scoparium*, *Veronica buxifolia*, *Dracophyllum longifolium* and *D. Pearsoni*, form the lower scrub. But the chief feature of the island plant-life is the wonderful moss cushions, the carpet of the forest appearing as if the whole was covered in boulders clad with moss, but in reality these heaps are solid moss and liverworts, whilst *Sphagnum* abounds in the bogs.

"The Tree Ferns, *Hemitelia Smithii*, are plentiful as well as Polypodiums, Aspidiums and other ferns too numerous to mention,

and over all is the death-like stillness of the forest, broken only by the occasional tinkle of the Bell Bird, sounding evensong, and the Tui or Parson Bird. The large Kiwi, called the Roa, is apparently still abundant, judging by the bore-holes seen, and the Weka or Woodhen, looking like a large Water-rail, are very numerous, and also inquisitive for they come within easy reach and may be caught with a landing net. On return to the ship, about 7 p.m., we found that those interested in the study of fish had caught some fine flounders and blue cod which we ate for breakfast the next morning. Weighed anchor about 9 p.m., and steamed under easy steam to the Snares Islands where we arrived on the morning of the 15th, in thick weather. These islands are composed of basalt, rising some 500 feet, with precipitous cliffs. Except on the Eastern side, where there is a convenient inlet which makes an excellent landing-place, the whole island is covered with dense semi-prostrate scrub, composed of *Olearia Lyallii* and *Senécio Muelleri*; the former with its silvery foliage is easily distinguished from the vivid glossy green of the latter. On the edge of this scrub, and along the cliff, grew the long coarse grasses *Poa littorosa* and *P. foliosa*, and mixed with them is *Veronica elliptica* and a plant which resembles in foliage a vegetable marrow, but in reality is *Stilbocarpa*, the flower of which, although green and black, forms a fine head, and is certainly worthy of a place in a garden. Dr. L. Cockayne whom I have been with, and who is the chief Botanist on the expedition, has pronounced it a distinct species from that growing on Auckland Island and named it *Bollonsi*, in honour of the commander of this vessel. In all there are about 13 species of plants on these islands only, but the bird life is wonderful. On approaching the shore dense colonies of Penguins were seen, and a few Terns and Gulls flying about. We found the landing place fully occupied by sea-lions, some of which were inclined to be truculent, and charged down the steep slope towards the sea scattering the party right and left, over which there was much merriment mingled with a certain amount of fear for he can bite to some purpose if he chances to get an opportunity. My main object in landing on this occasion was not so much to hunt plants as to catch the many flightless birds, and this to me was of great interest, I had provided myself with a long-handled landing-net and a sack for the purpose; the idea being to transport the birds (land) when caught to the island named Kapiti, in Cook's Strait, which is held among other islands, by the Government, as a reserve for native birds and plants; which precaution is becoming every year more necessary, since the native birds are fast disappearing. The first bird I saw was a brown fern bird, about the size of a hedge sparrow, but with a fan-shaped tail, and I found them great experts in escaping capture, but with the aid of four Maoris whom we had brought with us, I rounded up the birds and then caught them in the landing-net. These and the Snipe, which in marking is very similar to our British full Snipe, but is much more sturdy in legs and bill, and has a much shorter tail, were comparatively easy to capture, but the Chatham Island Robin, which although tame could fly, and was just wary enough to keep out of reach, was much more difficult to catch, but we managed to secure a few. Our labours were all in vain, however

as they have all since died. The Snipe lived six days, and fed on worms easily and greedily, but it seemed to me that the cold weather experienced in the Auckland Islands finished them off. Skuas (Cape hens), Mollyhawks and Petrels abounded; the latter underground with the Mutton birds and Whale birds uttered weird gurglings in the bowels of the island. We left the islands in thick weather, in the evening, and steamed easily about 150 miles further South, to the Auckland Islands, which we made the next morning about 5 a m., Nov. 16th, in thick drizzling weather and a moderate sea. Our first port of call was Port Ross, on the N.E. side of the island; and at the head of it flew a dirty rag on a pole and presently the beach became alive with men. They were a shipwrecked crew. I must here tell you that the New Zealand Government provide provision depôts, boats and sheds on all the Southern Islands, and this vessel goes once in six months to examine them, and for this purpose we visited Port Ross, a great arm or fiord stretching into the heart of the island, and overlooked by heights 2,000 feet high, in dense foliage up to 600 feet, and then a low scrub, till the grass line is met at 800 to 1,000 feet. The ship's boat was launched and Captain Bollons went ashore, and soon came with the news of the wreck, and four of the men themselves rowed off in the Government boat, to get more provisions from our vessel, as they had nearly exhausted the store ashore. The four-masted barque, Dundonald, bound from Sydney to England, with grain, went ashore at 12.30 a.m. on March 7th, 1907, on an isolated desert island, devoid of a depôt or boat, about five miles off the west coast of the main island. It was a pitch dark night with thick drizzling rain. The watch had just changed when towering cliffs were seen rising right above them. There was no room to wear the vessel, although an attempt was made, and she was driven smack into a cleft, in the cliff, with half a gale of wind behind her. Out of a crew of 27, there were 15 saved, and 12 drowned, including the captain and his son and most of the ship's officers. The only way of getting ashore at all, was by way of the mizzen, and so on to a ledge of the cliff, but the first man who attempted it, slipped on the cliff and was dashed to pieces on the rocks. The second man was more successful and got a rope ashore, and another man came after him, and they together managed to work round the cliff, and got a line aboard to the rest of the crew who were all assembled on the foc'sle. By this time the vessel was in two halves and some had been washed out of it and drowned, including the captain, his son and the chief steward. Eventually 16 got ashore, including the old mate, who got the line ashore originally, but who afterwards died of exposure, and was buried on the island. The crew lived on penguins and mutton birds, and various petrels and sea-lions for six months, and managed to make a rough boat out of bits of sail cloth, and trees cut down on the island, and in this, picking a calm day, four of them managed to find a landing on the main island (last October). The four then proceeded inland, to try and discover the provision depôt, which the old mate had told them existed on the east coast of the main island. They failed, however, and as their pot of fire had been swamped on landing, they were obliged to return whence they came; after six weeks had passed and another boat had been constructed, three men set off and

landed again on Auckland Island. They wandered along the cliff for some time, until they came to a finger-post directing them to the depôt, to which they made their way, in spite of the dense tangled mass of undergrowth, and the fact that the only boots they had were made of sealskin, and their clothes were mostly of sail cloth. Having arrived at the depôt, they launched the boat there, and after provisioning it, they sailed and rowed round the north end of the island, and reached the north harbour, where they put in on account of bad weather; from there, watching an opportunity, they got back to the scene of the wreck on Disappointment Island, and in three trips brought the rest of the shipwrecked crew across to the main island. Landing on the western side, and walking overland, the boat was then sailed around again to Port Ross and so all the survivors were safely accommodated, after six months' fearful privations and suffering from cold, wet, and hunger. Wood was available in plenty but they could only muster two matches between them. With these they lit a fire, and kept it going, bringing it to the mainland in an old tin. When we rescued them they all looked very fit and well, and had had time to recoup after their terrible time on Disappointment Island. After taking on board one of the castaways to act as cook to the Campbell Island party, and after reprovisioning the depôt, we sailed south about 7.30 a.m., and proceeded down the coast to Carnley Harbour, which was the destination of the Auckland Island section of the expedition. Carnley Harbour is entered from the east, between the two fine heads, the southern of which is Adam's Island, separated from Auckland Isles by a narrow strait, which widens out into a mass of inlets penetrating Auckland proper. The western end of the strait is exceedingly narrow and only navigable at great risk, since the enormous send of the Southern Ocean breaks with great force against the entrance, which added to the tide rush through the narrows, creates a dangerous rip. The scenery is very fine, and the harbour magnificent. The hills rise abruptly to 2,000 feet. The Rata dominates the lower zone to 600 feet. Then comes the long Tussock grass, *Danthonia bromoides*, mixed with *Suttonia divaricata*, stunted Rata and *Coprosma*, to about 800 to 1,000 feet. This zone is known to us as the Suttonetum, and is almost impenetrable; it is luckily thornless. The *Danthonia* forming large tussocks grows its own peat, and where it is absent the bushes have grown in the shelter of the pits thus formed, and have had the effect of making the surface exceedingly rough and difficult to traverse. It resembles a succession of peat hags, and a fall off a *Danthonia* tussock means complete disappearance and much annoyance. But if this form of country is bad, perhaps the *Suttonia* scrub is worse, for matted together by the necessity of protection from the violent gales, it is about waist deep. There are three methods adopted for progressing you must either walk on the top, roll over the top, or crawl underneath. The two former methods were generally adopted. For example, it took four of us, two and a half hours to drop down a hill from 700 feet to sea level, and the distance was scarcely a mile. Our camp was fixed on a promontory forming the eastern arm of Camp Cove, where there was a depôt and boat shed which has been the home of many a shipwrecked mariner in the past, and no doubt will be again at no distant date,

for the wrecks are numerous. Attached to the Expedition was a whale boat, manned by five Maoris, and by this means we established flying camps to the various bays and inlets of the harbour, the main camp remaining at Camp Cove peninsula. For ten days we carried on explorations, the various parties scattering in pursuit of their particular interests. The island, geologically, was practically unknown, and in this branch many important discoveries were made; the Flora better known and studied by Hooker in 1840, and later by Kirk and Chapman, was also successfully exploited, and perhaps some 8 or 10 species previously unknown to the island will be added to the list. On this day, the 26th, the S.S. *Hinemao* returned about midnight, and we left Carnley Harbour for Norman Inlet about 5 p.m. and anchored there for the night; the next morning, the 27th, all went ashore at 4 a.m. This is a narrow, but deep inlet, and a boat is kept here for the use of shipwrecked crews. Close around the shed grows *Hemitelia Smithii*, the most southern Tree Fern known. At this point we were at no distance (some three miles) from the head of North Arm, Carnley Harbour. The heights between are about 2,000 feet high, and crowned by fine basaltic rocks, known as the Giant's Tomb and Flat-topped Hill. It was from the North Arm that we got our first view of the west coast of the island which is precipitous throughout its entire length with the exception of a small bay facing Disappointment Island, which was the place where the shipwrecked crew landed. The distance from North Arm to the West Coast is barely two miles, up a gentle rise, and there a magnificent view met us. The cliff at the place where we struck it was 780 feet sheer into the sea and on either side of us they rose to 1,400 feet. Close by was a waterfall which fell straight over the cliff, the water, however, never reaching the bottom in a flow, the wind scattering it and spindling it out into a thin mist. Then far away north we saw smoke and thought that the castaways had lit a fire but our glasses revealed three streams, endeavouring to reach the sea, but the winds cast it all back and blew it up the island again. In the N.W. loomed Disappointment Island and the pinnacle rocks of the N.W. Cape of the Auckland Island. After this astounding view, we all thought the wretched crew of the ill-fated vessel lucky in striking where they did, for had they missed it and gone on the mainland coast their chance of scaling the cliffs would have been very small indeed. After examining the plants, &c. in Norman Inlet, we sailed north at 8.30 a.m. for Port Ross. The sea was calm but weather overcast. After blowing our syren into two creeks, we made for Enderby Island, at the head of Port Ross. This island was formerly a whaling station, but with the extinction of the whale, the settlement died out also. It was started by Enderby in 1850, and cattle and goats are still fairly plentiful. We anchored off a sandy beach, on which were some forty sea-lions; a few were also on the high sand-dunes behind. Some of them were doomed to destruction as the zoologists required some specimens for the museums. The party therefore set out to the attack. A few clubs and a couple of rifles soon stretched out four; it was an ignominous proceeding as the sea-lions instead of trying to escape awaited the onslaught with a placid mind and were soon despatched. The next entertainment was the capture of flightless

ducks, for the purpose of taking them and introducing them on Kapiti Island, in Cook Strait. For this purpose Dr. L. Cockayne and myself, with a photographer, set off with Captain Bollons in a boat to Ewing Island, about two miles S.E. The birds were soon captured, but it required a good deal of activity. The ducks were first located among the boulders along the shore; the presence of the boat sent them up the bank and it then became a land hunt, the birds generally disappearing down a mutton-bird hole. The island was also very interesting from a naturalist and botanical point of view. The birds are, on all these islands, remarkably tame. The pipits, rather lighter in plumage than the English meadow pipit, the black and white robin, and the snipe seemed to constitute the land birds. The ground was honeycombed with the holes of the various petrels, and there was a large shag rookery on one of the headlands. These shags are about the same size as the common British shag, but have a white breast and bar on the wing, while the head and back and tail are dark but set with a very lovely sheen in various shades of green. The chief interest among the plants was the forest of *Olearia Lyalli* which covered the low island from one end to the other, and is particularly interesting since it is not found on the other islands of the Auckland Group, with the exception of a small patch on the main island, at Port Ross. I have already described it growing on the Snares, where, however, I was unable to get any seedlings, but here the floor of the forest was carpeted with young plants of all sizes. It appears that the Rata (*Metrosideros lucida*) and this plant do not agree, and that the Rata will swamp it out, hence its disappearance from the main islands. The clear places on the island were ocupied by *Poa littorosa* growing in large tussocks. Having caught a dozen ducks we returned to the ship and after collecting the rest of the party from Enderby Island, we steamed to a more favourable anchorage, close to the depôt where the castaways were encamped. The next day, November 28th, after putting a geological party ashore on Auckland Island, we weighed anchor at 6 a.m. for the scene of the wreck on Disappointment Island. This point of the expedition was one of the most interesting parts of all, not only from the point of view of the wreck, but from the fact that no scientists had ever been on it, and it was entirely unexplored, both botanically and geologically. The impression that it was covered with Rata was soon dispelled, for at first sight no bush was to be seen at all. We landed in a small and convenient rift in the rock, and saw up the hill a *Poa littorosa*, and a magnificent meadow of *Ligusticum latifolium*, dotted with thousands of penguins and mollyhawk, whilst in addition *Pleurophyllum speciosum*, *Stilbocarpa polaris*, *Veronica Benthami* and *Bulbinella Rossii* formed the chief vegetation of the island. The first object of interest was a kind of cradle made of crooked bits of stick, which we identified as constructed from the wood of *Veronica elliptica*. This was the framework of the boat constructed by the castaways by means of which four of them* reached the main island and discovered the depôts in Port Ross.

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*[An article on the wreck of the Dundonald with various photographs, including one of the boat built of branches of *Veronica elliptica* will be found in *The Wide World Magazine*, May, 1908, p. 179.]

The canvas for the boat was obtained from one of the sails but long before the possibility of a boat was ever thought of, the men had cut it up to make shirts and trousers. So with needles made out of birds' bones and twine saved from the wreck, they laboriously sewed the canvas together, and after greasing it with seal oil, attached it to the rude framework. Whilst four of the men went to the scene of the wreck to fetch the body of the mate Peters, who had died from exposure, the scientists scoured the island, and visited the huts built by the castaways, in which they had lived six months. Built of peat and thatched with tussock grass, they made admirable shelters in which two or three men could sleep. For rugs the skins of the albatross and mollyhawk were adopted. The geologists here made important discoveries of ancient sedimentary rocks, thus adding another link to the already established theory of a great sub-antarctic continent, further proofs of which it was one of the main objects of the Expedition to discover. The geologists also made valuable collections of earthworms, woodlice, etc., identifying the same as identical with those of Kergulen and Fuegia. In a great measure also the plant life of the island goes to prove the existence of a sub-antarctic continent joined to that of New Zealand. The weather for these latitudes throughout the stay of the Expedition has been normal and perhaps finer than is usually the case. It has rained every day but never for the whole day, while the winds have been 'moderate to strong' from N.W. to S.W. The nature of the country is boggy peat, the steep ascents and thick scrub making it very difficult to traverse, except above 1,000 feet, then the ground becomes stony.

"On our leaving Disappointment Island, about 12 noon, we steamed in the Hinemoa south as far as Cape Bristow, and then up the western cliffs and round N.W. Cape back to Port Ross. All then went ashore at the depôt to bury the poor mate in the little cemetery, Captain Bollons reading the burial service, a most impressive scene, the tomb stones telling of untold suffering of mariners long ago, of the two men who died of starvation, of a child aged three months, and inscribed on a slate hanging on a stick 'Unknown.' The ceremony over we returned on board, and to-day the 29th, the morning broke clear and fine with an occasional shower and wind W. 'moderate.' The morning is being spent re-victualling the depôt and in magnetic survey. We sailed at 12 noon for the Bluff."

In "The New Zealand Times" for December 11th, 1907, DR. COCKAYNE gives the following account of the Snares, about which group less has been published than about the other islands :—

"The Snares consist of two fairly large islands and some rocks built up entirely of granite, the precipitous cliffs of which, especially on the western side, tell the story of a large land surface in the past. This conclusion, too, is amply supported by the botanical evidence, since the islands contain but 23 species of flowering plants and ferns, the sole survivors of a much more varied assemblage in the days gone by. As a land surface shrinks owing to well-known geological causes, the struggle for existence among its plant, and for the matter of that, animal inhabitants, becomes keener and keener and is intensified by climatic changes also,

which may assume such an intensity that only a favoured few possessing some peculiar advantage can subsist. Amongst these are frequently species not found elsewhere, and such havens of refuge are the happy hunting ground of the biological collector. The Snares supply their quota of evidence to this theory. Of animals peculiar to the group there is a dainty little snipe which lives amongst the grass tussocks, probing into the peaty ground with its long bill in search of worms; also a sprightly black robin and a fern-bird, these two latter flitting about amongst the *Olearia* trees quite without fear of human beings. The *Olearia* covers much of these islands with a sage-green mantle. It, like the rata, has a fan-spreading and prostrate trunk, which habit in this case is perhaps hereditary, since seedlings not exposed to wind at all show the same bending of the main stem at quite an early stage. Its leaves are large and thick and leathery, but especially noteworthy is their covering of white felty hairs on the under-surface, which not only renders them beautiful through the contrast afforded, but prevents them losing water too rapidly, a matter of much moment in a climate with fierce winds and a sour soil of peat. This tree is not peculiar to the Snares, but it is very rare, nevertheless, being found only on Ewing Island, of the Auckland group, together with a few trees at the end of the main Auckland Island. The matter is rather too intricate for discussion here, but there is reason to believe that the tree in question may have been a member of the now vanished and problematical forest of an ancient Antarctic Continent. Peculiar to the Snares, too, is a plant of the ivy family, which I am proposing to call after my esteemed friend, Captain J. Bollons, of the Hinemoa, who not only on the occasion of the sub-antarctic expedition but for many years past has done much to advance New Zealand natural science. The plant has very fine green leaves, resembling somewhat those of a vegetable marrow, given off from remarkably thick creeping stems, and it bears rather large, but by no means showy, masses of waxy greenish flowers. The genus *Stilbocarpa*, to which it belongs, is confined to our New Zealand sub-antarctic islands, and to Stewart Island and Ruapuke, and is also related to a foreign plant from which a product of commercial value called ginseng is produced. The Snares species was originally confused with the magnificent Chatham Island forget-me-not, a plant-geographical fact of great importance had it been true.

"Perhaps the most interesting matter regarding the Snares' vegetation is that the distribution of the plants is determined by the wind and by the presence of countless penguins and numerous sea-lions. With regard to the animal influence, it is hardly going too far to assert that the whole island is constantly being freshly manured by the birds, and that so far as the tussock meadow is concerned, portions are alternately being destroyed and renewed. The wind regulates the distribution of the plant associations. Where it is not too strong, forest, or perhaps I might term it scrub, can flourish, where stronger a luxuriantly growing grass called *Poa foliosa* is abundant, but in the most wind-swept spots this latter gives place to a tussock grass found in all other groups of the islands named *Poa scoparia*, whose slender hard leaves can better resist wind and allow much less evaporation than the broad ones of the first-named species."

In the same journal Dr. Cockayne gives a few general notes on the more remarkable plants and general vegetation of the southern islands, which are reproduced in conclusion :—

"First and foremost comes the meadow of stately, and for the most part lovely, herbaceous plants which at sea level on Adams Island, the most southerly of the Auckland group, and on the higher land of the islands generally, cannot fail to move admiration even in one knowing nothing of plants or of botany. Perhaps the monarch of the meadow is a majestic plant of the daisy family, belonging to a genus purely sub-antarctic, called *Pleurophyllum*, related to the asters, so well-known in gardens. The leaves are of great size and are corrugated. Their colour and general appearance somewhat resembles a pale green velvet or plush. The plants, with their huge goblet-like form are striking enough, but when the beautiful purple flower-heads are raised high in the air, dozens at a time, and side by side, they become a glory. There are perhaps three other species of the same family ; one with silvery leaves just tinged with green and dotting the upland meadows as far as the eye can reach affords a charming spectacle. With this as companion plants are a buttercup with a golden flower, large out of all proportion to the size of the plants ; a *Veronica* with straggling branches and many blossoms of ultramarine blue ; the prince of tree forget-me-nots—*Myosotis capitata*—its flowers a dark but most vivid blue ; gentians, their petals marked with purple lines or lilac, white and even crimson ; a *Celmisia*, which forms close mats of small stiff rosettes of glistening leaves, not unlike highly polished greenstone and with flower heads the size of a shilling, purple in the middle and with pure white ray florets. Occasionally individuals may be met with whose flowers are purple throughout, and such would be an acquisition to any rock garden. There is a member of the lily family with very fine orange-coloured blooms, densely set on a succulent stalk, and which although beautiful enough individually becomes still more worthy of admiration when, in countless numbers, they light up a whole hillside. One especially pretty plant forms bright green and dense cushions, these in due season becoming snowy masses of whiteness from their numerous and close-set small blooms. There are other flowering plants which although not showy, are, for different reasons, of much interest. *Cotula plumosa*, a species with bright green, elegant, feathery leaves, occurs also on the far-distant Crozet Islands. There is a species of plantain peculiar to Auckland Island on the high mountains, and yet another which forms small rosettes on the rocky shores. A bright green cushion plant of the pink family of most dense habit grows on the coastal rocks of all the New Zealand sub-antarctic islands, but is found nowhere else. A tall and handsome groundsel occurs on Antipodes Island alone, and there only on the ground manured by the netty.

"The most common plant association of the Auckland Islands—it occurs in Campbell Island also—is a meadow consisting of a large tussock-grass called *Danthonia bromoides*, which puts one much in mind of the snow-grass meadows of the southern alps of New Zealand. But here all resemblance ends. Burn the *Danthonia* tussock and it does not come up again. Frequently,

too, it is mixed with certain shrubs which grow with interlaced branches, and the presence of these in conjunction with the boggy nature of the ground and the many hollows it contains makes progress through such a meadow a quite laborious business.

"Between the tussock and the forest is the scrub, a plant-association of astounding density, which character is furnished chiefly by the shrub before-mentioned with wiry interlacing branches of *Suttonia divaricata*. You can walk on its top, you can roll over it, but usually you can no more burst through it than through a thick gorse hedge.

"The most important and peculiar characteristic of the sub-antarctic plants is their capacity for rapidly turning into peat, a phenomenon directly in harmony with the climate. So strong is this tendency that many are forming peat in their lower portions and growing above with vigour, the living part putting forth roots and subsisting on its own dead remains. So do the *Danthonia* and *Poa* grasses build up trunks, and some of the smaller plants cushions. Everywhere is a soil of peat. Even on the faces of the perpendicular cliffs several feet of peat may have accumulated and become occupied by two species of ferns with thick and dark-green leaves.

"Ferns, as elsewhere in the New Zealand biological area, are a feature of the sub-antarctic islands. Delicate translucent filmy ferns abound in the rata forest, and even form colonies many yards in extent on the wet upland meadows. The commonest fern, *Polystichum vestitum*, contrary to its usual habit, has frequently a stout trunk. More interesting is the fact, that in the neighbourhood of Norman's Inlet grows a true tree fern, the most southerly plant of its class upon the earth! A tiny polypody, hardly the length of one's little fingernail, clothes portions of the rock summits, both in the Aucklands and Campbells, while just emerging from the rocky ground at the time of our visit was an old acquaintance common in similar stations in the Southern Alps and even on Mount Egmont, one of the few New Zealand ferns whose leaves die down to the ground in winter.

"The scenery of the sub-antarctic islands as a whole exhibits both beauty and grandeur. Buffeted continually by the waves of a vast and stormy ocean, the coasts are rugged and precipitous. The view from the summit of the western precipices of Auckland Island is sublime. Black basaltic cliffs descend in places so abruptly to the sea for 1,800 feet that a stone could easily be dropped from summit to base. Precipitous knife-like razorbacks separating wedge-shaped openings in the cliff occur at more or less regular intervals along the whole of this iron and inhospitable coast-line. On the day the botanists visited the spot the sea was unusually calm; no white-crested waves were visible save on the fringe of rocks at the cliff's base, and yet the thunder of the breakers continually burst upon the ear. Near by a waterfall fell in glistening silver over the cliff, only to be returned as snake-like spray, nor ever reached its goal, the sea. A short distance to the west lay Disappointment Island, that most inhospitable of spots where the shipwrecked crew of the Dundonald so heroically faced privation and finally conquered Nature in her most adverse mood.

2. A Sea Shore Meadow.

3. Prostrate 'Rata'—*Metrosideros lucida.*

To face page 248.

4. Disappointment Island.

5. *Stilbocarpa polaris*.

"Carnley Harbour shows scenes of a more peaceful beauty, though when her waters are lashed by the furious winds and the roar of storm is everywhere, while grey mists sweep over the mountains, it is gloomy enough. But on a bright day with the land-locked waters glistening in the sunshine, the brown hills, and the forest of varied greens, the aspect is truly beautiful, and may well challenge comparison with the lakes of Scotland."

Explanation of the Plates.

1. Tussock grass (*Poa litorosa*) with *Olearia Lyallii* in the background. Dr. Cockayne is standing on the left of the tussocks.
2. A sea shore meadow, shewing *Pleurophyllum criniferum* with a foregrounnd of *Ligusticum latifolium* on the left and some leaves of *Stilbocarpa polaris*, on the right *Ligusticum* with *Poa foliosa*.
3. Prostrate 'rata' (*Metrosideros lucida*) on Auckland Island.
4. Disappointment Island shewing the huts built by the castaways. The N.W. Cape of Auckland Island in the distance.
   In the foreground plants of *Bulbinella Rossii*.
5. *Stilbocarpa polaris*.

The photographs were taken by Capt. A. A. Dorrien-Smith.

XXXII.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS L.

491. **Asterophorum**, *Sprague*, gen. nov. [Tiliaceae—Brownlowieae]; peraffinis *Christianae*, DC., a qua carpellis fructus connatis differt.

Flores unisexuales, ut videtur monoici, masculi tantum visi. *Calyx* campanulatus, lobatus. *Petala* 5, imbricata. *Stamina* numerosa, centralia, omnia fertilia, filamentis inferne connatis. *Capsula* 5-locularis, loculicida, loculis 1-spermis, valvis in apicibus carpophori stellati suspensis. *Endospermium* carnosum. *Embryo* cotyledonibus foliaceis, radicula exserta.

Asterophorum eburneum, *Sprague* (species unica).

Arbor subramosa, 4·5 m. alta (teste *Spruce*). *Rami* striolati, primum stellato-pubescentes, mox glabrescentes. *Folia* oblongo-ovata, basi rotundata vel subtruncata, apice obtusiuscule acuminata, 12–25 cm. longa, 6–10 cm. lata, utrinque satis inconspicue subtiliter reticulata, supra in nervis stellato-pubescentia vel puberula, ceterum glabrescentia, subtus minute puberula et lepidota; nervi laterales utrinque 8–10; petioli 3·5–7 cm. longi. *Stipulae* subulatae, 1–5 mm. longae, caducae. *Pedunculi* 5·5–6·5 cm. longi, ramis circiter 4. *Flores masculi* in apicibus ramorum rhachis umbellati, eburnei et odorati (teste *Spruce*), pedicellis 4–5 mm. longis. *Calyx* 4·5 mm. longus, trilobatus, extra stellato-tomentellus, intra glaber, lobis deltoideis 1·5–2 mm. longis. *Petala* oblanceolata, rotundata, 7 mm. longa, 2–2·5 mm. lata,

glabra. *Stamina* 32–34, filamentis usque ad 6 mm. longis inferne connatis, exterioribus brevioribus, antherarum thecis apice contiguis deorsum divergentibus. *Capsula* subturbinata, obtuse 5-angulata, apice leviter depressa, 1·5–2·3 cm. longa, 1·7–2 cm. diametro, extra dense stellato-pubescens, endocarpio crustaceo fulvo nitidulo tandem soluto. *Semina* ovoideo-globosa, cinerea, brunneo-variegata, 6–7 mm. diametro.

ECUADOR. Chonana near Guayaquil, *Spruce*, 6260.

Asterophorum has the floral characters of *Christiana* and the fruit of *Pityranthe*. The fruit of *Christiana* consists of several (five or fewer) free follicles, and *Asterophorum* must therefore be regarded as generically distinct from it, in spite of the great resemblance in habit and floral characters. The carpels of *Christiana* at the time of flowering are united to one another by the lower part of the ovaries only; owing to the interlocking of the long hairs with which they are clothed, however, the whole of the ovaries and the lower part of the styles appear, on superficial examination, to be connate.

Speirostyla, Baker (Sterculiaceae), is identical with *Christiana*, and *S. tiliaefolia*, Baker, is *Christiana madagascariensis*, Baill. Both authors, indeed, quote Hildebrandt, 3262, as a type specimen. Baker (Journ. Linn. Soc. vol. xxv., p. 299), when describing *Speirostyla*, wrote "This seems to have quite as good a right to be placed in Tiliaceae as in Sterculiaceae," and Schumann subsequently placed it in Tiliaceae beside *Christiana*, from which he distinguished it by the stigmas (Engl. & Prantl, Nat. Pflanz. Nachtr. 1, p. 233). There is no essential difference between the stigmas of *Speirostyla* and *Christiana*, however, the actual form being intermediate between the figures in Martius, Fl. Bras. vol. xii., pars. 3, t. 25, and Journ. Linn. Soc. vol. xxv. t. 50. Baillon, Hist. Pl. Madag. t. 81 is an excellent figure. The description and figure of *Speirostyla* are somewhat misleading, the carpels being in reality free from one another except at the base, and the ovules being solitary in each cell, as indeed they are shown in the figure. The number of carpels varies from five to seven, according to Baillon.

492. **Derris Hanceii**, *Hemsl.* [Leguminosae-Dalbergieae], in Bot. Mag. ad tab. 8008, absque descriptione plena et habitatione; species *D. oblongae*, Benth., similis, ab ea tamen foliolis paucioribus et calyce extra glabro differt.

Frutex scandens, fere undique glaber. *Folia* graciliter petiolata, 5–9-foliolata; foliola petiolulata, tenuia, oblongo-obovata, 5-7 cm. longa, obtusa, subtus pallidiora, venis ultimis minutissime reticulatis. *Flores* iis *D. alborubrae* similes, in paniculas angustas laterales 7–12 cm. longas suberectas dispositi; pedicelli graciles, quam flores breviores. *Calyx* fere truncatus, intus pubescens. *Petala* unguiculata; vexillum complicatum, lamina basi bicristata; alae apice ciliolatae. *Ovarium* hirsutum, 2-ovulatum; stylo stamina aequans. *Legumen* (immaturum tantum visum) planum, circiter 4 cm. longum, coriaceum, glabrum, monospermum (an semper?) ovale, utrinque attenuatum, apice acutum, suturis anguste alatis.—*Derris oblonga*, Hance in Journ. Bot. 1879, p. 10, non Benth.

CHINA. Kwangtung; among rocks on the muddy banks of the Canton River, *T. Sampson*; Shing-hing Pass, West River, *C. Ford.*

493. **Philadelphus madrensis**, *Hemsl.* [Saxifragaceae-Hydrangeae]; species *P. microphyllo* proxima, differt ramulis floriferis elongatis, foliis subtus sericeo-pilosis apiculatis, floribus minoribus et calyce extra dense tomentoso.

Frutex ramis floriferis gracillimis valde elongatis rubris striatis parce pilosulis apice 1–3-floris. *Folia* subsessilia, tenuia, ovata, 1·5–3·5 cm. longa, acuta, apiculata, basi rotundata, semper integra, subtrinervia, subtus dense sericeo-pilosa, alba, supra parce pilosula, demum glabrescentia, in axillis coma densa pilorum brevium alborum instructa. *Flores* tetrameri, circita, 2–5 cm. diametro, saepius solitarii, previter pedicellati. *Calyx* extra intusque hirsutus; lobi crassi, ovati, circiter 0·5 cm. longi, apiculato-acuminati. *Petala* alba, ovata, 1 cm. longa, apice rotundata, basi lata. *Stamina* circiter 32, inaequalia, longiora 6–7 mm. longa, filamentis in phalanges 4 plus minusve connatis. *Ovarium* apice glabrum vel pilis paucissimis instructum; styli glabri, ad medium connati.—*P. mexicanus*. Seem. Bot. Voy. Herald, p. 294, et. Hemsl. in Biol. Centr. Am., Bot., vol. i. p. 384, pro parte, non Schlecht.

MEXICO. Sierra Madre, Durango, *Seemann*, 2167.

494. **Begonia (Knesebeckia) dichroa**, *Sprague* [Begoniaceae]; species distincta, nullae adhuc cognitae proxima, floribus femineis bicoloribus.

Planta elata, glabra, pilis minutis moniliformibus glandulosis in innovationes et inflorescentiam adspersis exceptis. *Folia* plantae juvenilis rhomboideo-elliptica, semicordata, acuminata, 10–12 cm. longa, 5–5·5 cm. lata, albo-maculata; folia in planta adulta sub anthesi incipiente provenientia ovata-oblonga, apice longe acute acuminata, basi valde obliqua, semicordata, 8-nervia, superne nervis utrinque 3–4 penninervia, 22 cm. longa, 9–11 cm. lata, margine leviter undulata, supra saturate viridia, nitidula, subtus pallida; petioli 2–2·5 cm. longi. *Stipulae* ovatae, acute acuminatae, 2·5 cm. longae, 1·5 cm. latae. *Pedunculus* 3 cm. longus, dichasium gradus quarti gerens, floribus masculis terminalibus, femineis axillaribus. *Bracteae* cymbiformes, in statu explanata ovatae, obtusae, 1–1·5 cm. longae, 0·8–1 cm. latae, ut rhachis coccineo-tinctae. *Flores masculi* pedicellis circiter 2 cm. longis. *Perianthii segmenta* 4, coccinea, 2 exteriora late obovata, obtusa, 2·3 cm. longa, 1·9 cm. lata, 2 interiora oblanceolata, rotundata, 1·2 cm. longa, 4·5 mm. lata. *Stamina* in toro convexo 1·5 mm. alto insidentia, filamentis 2–3 mm. longis, antheris vix 1·5 mm. longis, loculis versus basin convergentibus. *Flores feminei* sessiles vel breviter pedicellati. *Perianthii segmenta* coccinea, 5, quorum 2 exteriora late obovata, obtusa, 14 mm. longa, 11 mm. lata, intimum oblongum, rotundatum, 7–8 mm. longum, vix 4 mm. latum, cetera 2 intermedia. *Ovarium* 3-loculare, 1·5 cm. longum, album, alis 6–7 mm. latis, placentis bipartitis undique ovuliferis. *Styli* basi brevissime connati, 3–3·5 mm. longi,

bifurcati, ramis vix ultra 1 mm. longis in helicem sesquicyclicam tortis, papillis externe infra furcam continuis ramos spiraliter ascendentibus.

BRAZIL. Described from fresh material communicated by Messrs. Haage & Schmidt, Erfurt. Very similar in habit to *B. maculata*, Raddi, which belongs, however, to a different section of the genus, in which the two segments of the placenta bear ovules on their outer faces only. The two species look remarkably alike when not in flower, the most obvious difference being that the leaves of *B. dichroa* are considerably less oblique than those of *B. maculata*.

495. **Pedicularis Komarowii**, *Bonati* [Scrophulariaceae-Euphrasieae]; species sectionis Myriophyllarum, *P. binariae*, Maxim. affinis; ab illa differt scapis ramosis, foliis amplioribus, tubo calycem vix superante, extra illo recurvato, dentibus calycis linearibus, vix incisis tubum aequantibus, rostro erecto partem inferiorem galeae paralleliter sequente et filamentis glabris.

Radix turbinata. *Scapi* multi, erecti, 8–15 cm. alti, plus minusve ramosi, ramis brevibus cylindricis glabris vel ad superiorem partem linealiter e margine petioli pilosis. *Folia* radicalia evanida; caulina opposita, pauca, longe petiolata (circa 10–14 mm.); limbus lineato–lanceolatus, 1-4 cm. longus, pinnatisectus; lobi 6–8-jugi, lineato-acuti, profunde dentati, distantes, sessiles, basi late decurrentes. *Bracteae* verticillatae, basi membranaceae, dilatatae, semi-amplexicaules, summo foliiformes, superiores fere integrae. *Flores* elegantes, purpurei, breve pedunculati (pedunculis 3–4 mm. longis glabris), in verticillos basi discretos summo propinquissimos conjuncti. *Calyx* campanulatus, ante non fissus; tubus 5–8 mm. longus, membranaceus, albidus, 10-nervatus (nervis eminentibus, haud reticulatis), in sulcis margineque villosus, summo profunde 5-dentatus; dente summo filiformi, integro lateralibus minore; illis lineato-lanceolatis tubum aequantibus superficialiter incisis margine ciliatis. *Tubus corollae* 5–6 mm. longus, rectus, extra calyce abrupte ac valde incurvatus. *Galea* obliqua, tubum superans, 12–10 mm. longa, margine integra, rectangula, in rostro recto, partem inferiorem galeae paralleliter sequentem (rostrum 2–3 mm. longum) abrupte terminatae; labium inferius galea duplo minus, sessile, superficialiter trilobatum; lobis lateralibus orbicularibus, medio valde minore, 2 mm. longo ac lato cucullato non eminente, omnibus lobis dense margine ciliatis. *Filamenta* glabra. *Capsula* ac semina non visa.

CENTRAL ASIA. Without locality, *Komarow*, 1893.

7120 496. **Pedicularis pteridifolia**, *Bonati* [Scrophulariaceae-Euphrasieae]; species sectionis Bristium praecise definita, foliis radicalibus; *P. vaganti*, Hemsl., paulo affinis, ab illa differt scapo erecto nudo, rostro nullo, galeae margine ciliata, etc.

Radix verticalis cum fibris filiformibus, uni vel pluricaulis. *Scapi* glabri, simplices, erecti, 15–30 cm. alti, nudi, vel vix folia pauca bracteiformia alterna minutissima gerentes. *Folia* radicalia amplissima, 20–28 cm. longa (petiolis 5–9 cm.), pinnatissecta, lobis 7–9-jugis; lobi inter se distantes, oblongi, acuti, pinnatifidi, 30–35 mm. longi, 10–15 mm. lati, sessiles, basi decurrentes.

Bracteae inferiores foliiformes, 2·3 cm. longae, superiores trisectae, lobis serratis. *Flores* 12–15 in spicam terminalem, brevissimam conjuncti, fere sessiles, lutei. *Calyx* glaber; tubus 5–6 mm. longus, ante non fissus, nervis 5 eminentibus, dentibus 5 parvulis 1 mm. longis integris filiformibus. *Corolla* 20–28 mm. longa; tubus erectus, glaber, calycem 3–4-plo superans; galea tubo duplo brevior, galeae *P. tristis*, L., similis, ante tamen paulo fissa, solum margine pilis albis ciliata; labium inferius breve (5–6 mm.) superficialiter trilobatum, lobis fere aequalibus, medio emarginato, omnibus margine dense ciliatis. *Stamina* corollae basi inserta, filamentis duobus villosis. *Capsula* ac semina non visa.

WESTERN CHINA. Mont Omi, *Wilson*, 5080, 4550.

497. **Pedicularis sparsiflora**, *Bonati* [Scrophulariaceae-Euphrasieae]; species *P. Petitmenginii* mihi affinis; ab illa differt pedunculis multo longioribus rigidioribus, filamentis villosis, labio ciliato, scapis fistulosis erectis, etc.

Scapus erectus vel adscendens, circa 40 cm. altus, crassus, fistulosus, plus minusve angulosus, pilis albis brevibus ac crispis in sulcis praeditus. *Folia* caulina alterna, petiolata (petiolis 1–2 cm. longis); limbus ovato-oblongus, 4–10 cm. longus, pinnatisectus, lobis 16–20 distantibus sessilibus basi decurrentibus profunde incisis, dentibus acutis glabris vel vix pilis crispis sparsisque additis. *Bracteae* foliiformes, petiolulatae. *Flores* omnes axillares, longissime pedunculati; pedunculis glabris erectis folia aequantibus. *Calyx* villosus, ante fissus, subspathaceus; tubus 5–7 mm. longus, nervis eminentibus, longe tridentatus (5 mm.), dentibus lateralibus basi filiformibus summo foliaceis; medio paulo minore longius stipitato, summo deltoideo superficialiter inciso. *Corolla* alba vel flavescens; tubus rectus, calycem vix superans; galea ac rostrum sicut apud *P. tortam*, Maxim; labium inferius 1 cm. longum, profunde trifidum, lobis orbicularibus subaequalibus margine ciliatis. *Stamina* fauce inserta; filamentis omnibus villosis. *Capsula?*

WESTERN CHINA. Without locality, *Wilson*, 4257 a.

498. **Sanchezia parvibracteata**, *Sprague et Hutchinson* [Acanthaceae]; affinis *S. nobili*, Hook. f., a qua petiolis exalatis, bracteis minoribus, floribus pro bractea paucioribus et staminodiis longioribus differt.

Planta erecta, pauciramosa, carnosa, glabra, circiter 1 m. alta. *Rami* obtuse tetragoni, fere 1 cm. diametro, purpurei, internodiis 3–5 cm. longis. *Folia* oblongo-elliptica, 12–24 cm. longa, 5–11 cm. lata, apice longiuscule acuminata, acuta vel obtusa, basi cuneata, repando-crenata, denticulis 5–10 mm. distantibus, venis ascendentibus utrinque 13–16 ut costa albidis inferioribus subrectis superioribus curvatis, petiolo usque ad 2·5 cm. longo haud vel superne tantum vix alato. *Inflorescentia* circiter 18 cm. longa, inferne leviter stricte ramosa. *Bracteae* late ovatae, usque ad 2 cm. longae et 1·5 cm. latae, 3–5-florae. *Bracteolae* obovato-oblongae, obscure 5-nerviae, 1·5–2 cm. longae. *Calycis segmenta* inaequalia, oblonga, obtusa, 2–2·5 cm. longa, 4–7 mm. lata, apice ciliolata, intus ut bracteae et bracteolae minutissime glanduloso-pilosa. *Corolla* tubulosa, in basin angustata, 5–5·3 cm. longa, lutea,

extra superne minute puberula, fauce 5 mm. diametro, lobis reflexis oblongis 5–7 mm. longis 3–4 mm. latis ciliolatis breviter bifidis. *Stamina* 1–1·3 cm. supra corollae basin inserta, filamentis 5·5–6 cm. longis sparse villosis, antheris 6–7 mm. longis hirsutis. *Staminodia* 3–3·3 cm. longa, apice subcapitata, sparse villosa. *Discus* 2 mm. altus. *Ovarium* 4–5 mm. longum, 3 mm. diametro, glabrum ; stylus circiter 7 cm. longus, inferne minute puberulus ; ovula 4–3 pro loculo.

TROPICAL AMERICA. Described from a plant cultivated at Kew, which was received from the Royal Botanic Gardens, Peradeniya, in 1905.

7087 499. **Pogostemon (Paniculata) Championii**, *Prain* [Labiatae-Satureineae] ; species *P. pubescenti*, Benth., quam maxime affinis, verticillastris tamen haud subsecundis aliisque notis satis differt.

Suffrutex suberectus, parce ramosus. *Caules* ramique graciles, distincte sed obtuse 4-goni, parcius pubescentes. *Folia* ramisque opposita, decussata, membranacea, ovato-lanceolata, acuminata, basi cuneata, margine basi integro excepto minopere duplicato-crenata, supra praesertim secus nervos sparse appresse pubescentia, subtus secus nervos sparse appresse pubescentia ceterum glabra, 6–8 cm. longa, 2·5–4 cm. lata ; petioli 1–1·25 cm. longi, parce appresse pubescentes. *Verticillastri* in spicas simplices continuas ovato-cylindricas pedunculatas 1·5–3·5 cm. longas, 1 cm. latas aggregati, pedunculis appresse pubescentibus 5 mm. longis ; spicae laxius ad apices ramorum paniculatae ; bracteae ovato-lanceolatae, virides, 3 mm. longae, calyce breviores. *Calyx* anguste campanulatus, 4 mm. longus, extra pubescens, lobis triangulis acutis aequalibus tubo triplo brevioribus. *Corolla* pallide purpurea, 7 mm. longa, margine loborum parce ciliato-pubescente excepto glabra, lobis subaequalibus. *Filamenta* subadscendentia, barbata. *Styli* rami subaequales, 1·5 mm. longi. *Nuculae* late ovoideae, glabrae.—*P. parviflorus*, Benth. in Fl. Hongk., p. 275 ; Hemsl. in Journ. Linn. Soc., xxvi., p. 276, nec Benth. in Wall. Cat. Lith. n. 1531.

CHINA. Hong Kong ; on Mount Parker, *Champion*, 339.

With the exception of *P. formosanus*, Oliv., a native of Formosa, this is the only *Pogostemon* as yet recorded from China ; even it has only once been collected. It does not bear a striking resemblance to *P. parviflorus* proper, though it is undoubtedly very closely allied to *P. parviflorus*, β *hispidus*, Benth. in DC. Prodr. xii., p. 152, a plant from Upper Assam, which has, with greater justice, though even then not altogether satisfactorily, been referred to *P. glaber* by Sir J. D. Hooker in the *Flora of British India*, vol. iv., p. 633. It bears an even more striking resemblance to *P. pubescens*, Benth. in DC. Prodr. xii., p. 152, a species which has been reduced to *P. parviflorus* in the *Flora of British India*, but which it seems more satisfactory to treat as distinct.

500. **Pogostemon (Paniculata) hispidus**, *Prain* [Labiatae-Satureineae] ; species *P. Championii* quam maxime affinis, bracteis tamen paullo majoribus, foliisque margine serratis satis differt.

Suffrutex erectus, ramosus 0·75–1 m. altus. *Caules* ramique robustiores, perobscure 4-goni, purpurascentes, parcius pubescentes. *Folia* ramique opposita, decussata, herbacea, ovata, acuta vel acuminata, basi cuneata, margine basi integro excepto duplicato-serrata, supra praesertim secus nervos sparse appresse pubescentia,

subtus secus nervos sparse appresse hispida ceterum glabra, 6–8 cm. longa, 3–5 cm. lata; petioli 1·5–2·5 cm. longi, sparse appresse hispidi. *Verticillastris* in spicas simplices vel parce ramosas plus minusve interruptas pedunculatas 1·5–4·5 cm. longas, 1 cm. latas aggregati, verticillastris inferioribus 6 mm., superioribus 1–2 mm. remotis, pedunculis appresse pubescentibus ·5–2 cm. longis; spicae ad apices ramorum laxe paniculatae; bracteae ovatae vel ovato-lanceolatae, saepe foliaceae, majores 8 mm. longae, 2·5–3 mm. latae. *Calyx* anguste campanulatus, 4 mm. longus, extra parce hispidus, lobis triangulis acutis aequalibus tubo triplo brevioribus. *Corolla* pallide lilacina, 7 mm. longa, glabra, lobis subaequalibus. *Filamenta* lilacina, subadscendentia, barbata. *Styli* rami subaequales, 1·5 mm. longi. *Nuculae* late ovoideae, glabrae.—*P. parviflorus* var. *hispidus*, Benth. in DC. Prodr. xii., p. 152. *P. glaber*, Hook. f. in Flor. Brit. Ind. iv., p. 633 partim, nec Benth. *P. glaber*, var. *pubescens*, Hook. f. Mss. in Herb. Kew.

ASSAM. Upper Assam, *Jenkins* (type of *P. parviflorus* var. *hispidus*, Benth.; flowering spp.); *Jenkins* 346 (fruiting spp.) Khasia Hills; *Hooker & Thomson*. Jaintea Hills; Jowai, *Hooker & Thomson*. BURMA: Shan States, *King's Collectors*.

Readily distinguished from *P. glaber* by its irregularly-toothed leaf-margins, its larger bracts and its interrupted spikes, and from *P. parviflorus* by its smaller leaves and much narrower spikes. It approaches *P. pubescens*, Benth., a Peninsular Indian species, more closely than it does either of the species mentioned, but is readily distinguished by its serrate, not crenate leaf-margins.

XXXIII.—GUAYULE RUBBER.

In the *Kew Bulletin* No. 7, 1907, p. 285, an account was given of the Guayule Rubber industry in Mexico. From the following despatch from His Majesty's Minister, Mexico, which has been received at Kew through the courtesy of the Secretary of State for Foreign Affairs, it would appear that the commercial importance of the Guayule plant will very shortly be a thing of the past.

HIS MAJESTY'S MINISTER, MEXICO, TO THE SECRETARY OF STATE FOR FOREIGN AFFAIRS.

Mexico.
May 19th, 1908.

SIR,

WITH reference to my Despatch of this Series No. 52 of December 3rd, 1906, and to later Despatches on the subject of Guayule (rubber) in Mexico, I have the honour to report that an American expert, who has been spending some time in this Republic in an exhaustive study of the Guayule industry has made the following pronouncement, which I hear from other sources is a fairly correct statement:—

"Based upon a conservative estimate there are only about 400,000 tons of guayule now in existence, either standing in its native soil, or at the plants, or on the way to the plants for extraction.

"This scarcity has become so marked that the most remote sections or districts are now being scoured and searched for the plant, and what appears to be the last place where the shrub can be found in any quantity, the Bolson de Mapimi district, is being thoroughly gone over and the guayule gathered and delivered under contract to the Continental Rubber Company of Mexico.

"This district, which lies between the Sierra Mojada and Torreon, is practically the last remaining district where there is guayule in any considerable quantity, all the other sections having been pretty well cleaned up and the remainder of the 400,000 tons has long since been purchased by the various extracting companies at prices ranging from $25 to $75 per ton (£2 10s. to £7 10s.).

"The purchases at the lower prices were made before the land-owners realized the value of the shrub, or entertained the slightest suspicion that the plant would not reproduce itself in a very short time.

"On account of the extremely slow-growing habits of the shrub this has been found to be improbable, and it is a practical certainty that with the consumption of the existing supply of 400,000 tons above mentioned, the guayule industry will go into decay.

"It had been hoped that experiments would be made by parties interested in the production, planting of seed and joining it with some kindred plant to accelerate its growth so that a wait of but four or five years would be necessary for the plant to obtain the proper size for extraction. This could be effected by grafting the guayule upon some kindred plant the roots of which would furnish the guayule tops with a greater flow of sap and consequently a more rapid growth than its own roots would furnish.

"Whether this can be successfully done or not remains to be seen, and has never, so far as I know, been attempted.

"In this grafting, however, is the only hope for the future of the guayule industry, as it is said the opinion of eminent botanists in the United States has been that the plants of two feet in height now being extracted have required seventy years for their growth.

"So far no reports have been made that any of the experiments which have been tried hold out any encouragement or prospect of success of reproduction, and it is more than likely that unless the grafting as described be tried and found successful the end of the industry will come when the present supply of guayule is exhausted. The mills will then be turned to some other use and the machinery dismantled or turned to the extraction of fibre or other similar uses.

"The flora of Mexico is, however, so varied, interesting, and so entirely unknown, that the untiring work of the chemist is likely at any time to discover possibilities in some of these plants that will make the guayule industry appear of trifling significance."

I have etc.,

(Signed) REGINALD TOWER.

XXXIV.—DIAGNOSES AFRICANAE: XXIII.

Erratum.—In Diagnoses Africanae, XXII., *Kew Bulletin*, No. 5, p. 219, for 920, read 920 (bis).

940. **Triplochiton utile,** *Sprague* [Sterculiaceae]; a ceteris speciebus foliolis integris recedit.

Arbor magna. *Ramulus* unicus visus subangulatus, minute lepidotus, 3–5 mm. diametro. *Folio* integra, petiolis 1·5–6 cm. longis apice rugoso-incrassatis; lamina elliptico-oblonga, basi obtuse cuneata, apice longiuscule acute acuminata, 12–22 cm. longa, 5·5–9 cm. lata, supra opaca, sublaevis, creberrime reticulata ope lentis validae visa, nervo medio acuto prominente, subtus densissime minute lepidota, lepidibus dense ciliatis, nervo medio et lateralibus prominentibus, venulis quam in facie superiore multo laxius reticulatis. *Fructus* siccus, monospermus, antice in alam ascendentem more *Acridocarpi* productus, dense lepidotus; corpus fructus plano-convexum, cymbiforme, 2·5–3 cm. longum, 1·2–1·5 cm. latum, facie ventrali subplano valde costato, costa superne secundum alam producta; ala 7–8 cm. longa, medio circiter 3 cm. lata, margine superiore subrecto, inferiore convexe arcuato in basin corporis angustato. *Semen* ab angulo superiore pendulum, circiter 2·5 cm. longum, 1·2 cm. latum, testa papyracea, hilo sublineari utrinque angustato 6–7 mm. longo, radicula supera. *Endospermium* superne radiculam exsertam 3 mm. longam involvens, ceterum bipartitum, segmentis plano-convexis. *Cotyledones* foliaceae, nervosae, endospermio aequilongae et aequilatae apice seminis excepto.

West Tropical Africa. Gold Coast; Hunisu, *H. N. Thompson*, 1.

The timber of this tree is exported to Europe as "Mahogany," according to Mr. Thompson. Until flowers are known, the systematic position of *T. utile* must remain a little doubtful; the fruit, however, agrees fairly well with that of *Triplochiton*, and the difference in the leaves is no greater than is found among the species of *Sterculia*. Native name "Nyankom."

941. **Pseudocedrela cylindrica,** *Sprague* [Meliaceae]; affinis *P excelsae*, Dawe et Sprague, a qua foliolis pluries minoribus supra pulchre reticulatis, fructibus perfectius cylindricis recedit.

Arbor magna. *Ramulus* unicus tantum visus valde acute angulato-costatus, minute puberulus, costis superne in bases foliorum incurrentibus. *Folia* 20–35 cm. longa, 7–9-juga, rhachi inferne pubescente ibique supra plana, superne minute puberula; foliola 1·5–3 cm. distantia, petiolulis 1–2 mm. longis, oblique oblonga, latere superiore majore, 4·5–9 cm. longa, 2·5–4 cm. lata, basi valde inaequilateralia, apice breviter acute acuminata vel apiculata, supra nitidula venulis prominentibus crebre reticulata, subtus nervo medio et lateralibus prominentibus, venulis minus conspicuis quam in facie superiore; nervi laterales utrinque 7–9 satis obliquis. *Capsula* matura fere perfecte cylindrica, utrinque rotundata, 13–16 cm. longa, valvis lenticellosis medio circiter 2·5 cm. latis, intus nitidulis colore obscuriore variegatis seminum

impressionibus distincte notatis tandem in laminas duas findentibus; columna centralis circiter 2 cm. supra semina suprema producta, basi obtusissima. *Semina* 4–6 pro loculo, perfecta non visa.

West Tropical Africa. Gold Coast, near Mansu and Supom, *H. N. Thompson*, 16.

Timber exported to Europe as "West African Cedar," according to Mr. Thompson. Native name "Penkwa."

942. **Xylia Evansii**, *Hutchinson* [Leguminosae-Adenantherae]; affinis *X. africanae*, Harms, sed pinnis 13–16-jugis et foliolis basi subcordatis vel rotundatis differt.

Arbor circiter 24 m. alta (teste *Evans*), ramulis subteretibus circiter 5 mm. diametro glabris vel brunneo-puberulis. *Folia* petiolata, bipinnata, pinnis unijugis, petiolis 1·5–4 cm. longis apice glandula magna ornatis ut pinnarum rachi supra canaliculatis breviter brunneo-pubescentibus, rhachi 10–24 cm. longa; foliola 13–16-juga, opposita, oblongo-lanceolata vel oblongo-elliptica, acute vel obtuse longeque acuminata, basi rotundata vel subcordata, 3–7 cm. longa, 1–2 cm. lata, supra glabra, subtus brevissime tomentosa, nervis lateralibus utrinque 9–12 arcuatis supra inconspicuis leviter impressis subtus elevatis, venis inconspicuis. *Capitula* axillaria, solitaria vel geminata, multiflora, pedunculis 3–6 cm. longis breviter brunneo-pubescentibus. *Bracteolae* 2·5 mm. longae, in apicem obtriangularem dilatatae, parce pilosae. *Calycis tubus* anguste cylindricus, 5-lobus, 3–3·5 mm. longus, ut lobi extus fulvo-tomentosus, lobis triangularibus obtusis 1–1·5 mm. longis basi 0·75 mm. latis. *Petala* lineari-oblonga, obtusa, 4 mm. longa, 0·5–0·75 mm. lata, extus fulvo-pilosa, intus glabra. *Stamina* 10, filamentis glabris 5–6 mm. longis, antheris 0·5 mm. longis apice glandula decidua. *Ovarium* 1 mm. longum, longe pilosum. *Legumen* compressum, oblongum, subfalcatum, basin versus angustatum, apice rotundatum, lignosum, perdurum, circiter 20 cm. longum, medio 5 cm. latum. *Semina* 4, obovato-elliptica, 2 cm. longa, 1·3–1·5 cm. lata, nitida.

West Tropical Africa. Gold Coast, without precise locality, *Evans*, 13; Tano River, a medium-sized tree, *Thompson*, 15.

According to Mr. Evans this is a valuable timber tree yielding a very hard wood. The leaves are beaten up and used as soap by the natives.

943. **Kitchingia uniflora**, *Stapf* [Crassulaceae]; affinis *K. gracilipedi*, Baker, sed foliis brevissime petiolatis, floribus solitariis, et staminibus supra basin insertis distincta.

Herba humilis, caulibus prostratis e nodis radicantibus glabris. *Folia* obovata, obtusa, utrinque 1–2-crenata, 7–10 mm. longa, 6–7 mm. lata, carnosula, laete viridia; petioli crassiusculi, 1–2 mm. longi. *Flores* solitarii, terminales; pedicellus filiformis, patule pubescens, purpurascens, supra medium minute bibracteolatus. *Calyx* alte 4-fidus, segmentis late ovatis minute apiculatis, parce pubescens, 3–3·5 mm. altus. *Corolla* tubulosa, basin et os versus leviter constricta, 4-dentata, circiter 2–2·25 cm. longa, 7 mm diametro maximo, pulchre purpurea, glabra, dentibus late ovatis obtusiusculis. *Stamina* ad basin corollae inserta, epipetala paulo

altius orta, fere faucem attingentia. *Disci glandulae* lineari-oblongae, 2-dentatae. *Carpella* fere libera, sub anthesi conniventia, anguste lanceolata, 6–8 mm. longa ; styli ad 12 mm. longi. *Folliculi* sursum divergentes, 8–9 mm. longi.

MADAGASCAR. The specimen from which this species is described was communicated by Mr. G. Bouvet, Director of the Jardin des Plantes at Angers. He writes that it was apparently introduced with other plants sent from Madagascar to Dr. Bontemps of Saumure in France.

944. **Begonia** (§ **Scutobegonia**) **modica**, *Stapf* [Begoniaceae] ; valde affinis *B. calabaricae*, Stapf, sed foliis minime cordatis, ovarii alis superne latissimis (saltem duabus) et fructu igitur magis minusve obpyramidato distincta.

Herba subacaulis. *Foliorum petioli* 3–4 cm. longi, pallide rubescentes, albo-hirsuto-villosi ; laminae oblique lateque peltato-ovatae, subacutae, 5–8 cm. longae, 4–6 cm. latae, leviter crenatae et undulatae, carnosulae, praeter margines obscure rubentes laete virides, supra glaberrimae, subtus in nervis primariis molliter hirsutae, nervis 6–8 radiantibus superne furcatis, umbone a sinu 1–1·5 cm. distante. *Pedunculi* pauciflori, 2–3 cm. longi, sparse pilosi. *Flores* terminales, umbellati, lutei, 2 masculi pedicellati, 1 femineus, subsessilis ; bracteae oblongae, 4 mm. longae, fimbriato-incisae. *Flores masculi:* pedicelli ad 18 mm. longi, glabri ; sepala 2, rotundato-elliptica, subaequalia, circiter 10 mm. longa, extus parce pilosa, superum extus magis minusve rubro-suffusum, intus basi maculo fere sanguineo ornatum, inferum utrinque sulphureum ; petala 0 ; staminum 12–13 filamenta basi in columnam brevem connata, inferiora antheras aequantia, ultra 1 mm. longa, superiora brevissima. *Flos femineus:* pedicellus subnullus ; sepala ut in masculis, sed suborbicularia ; petala 0 ; styli 4, basi breviter connati, 2 lin. longi ; stigmata reniformia, papillarum serie continua, 1·5 mm. lata ; ovarium sub anthesi rubens, 9 mm. longum, 4–5 lin. latum alis inferne paulo angustatis parce ciliatis inclusis. *Fructus* maturus non visus.

WEST TROPICAL AFRICA. Gold Coast, on rocks, at 180 m., *J. Anderson* (Kumasi). Described from a plant in cultivation at Kew.

945. **Cyclocotyla**, *Stapf*, gen. nov. [Apocynaceae—Plumerioideae] ; affinis *Craspidospermo*, Boj., sed calyce 5-lobo intus multiglanduloso basi annulatim incrassato una cum axi dilatata excavata cupulam crassam formante, disco ovarium cingente, et antheris linearibus longis distincta.

Calyx 5-lobus, basi annulatim incrassatus, una cum axi dilatata excavata in cupulam crassam fusus, lobis membranaceo-marginatis rotundatis intus glandulis numerosis squamiformibus stipatis. *Corolla* hypocrateriformis, tubo cylindrico carnosulo fauce esquamato ; lobi 5, contorti, sinistrorsum obtegentes. *Stamina* supra basin inserta ; antherae sessiles, lineares, tubum corollae fere aequantes, loculis basi inappendiculatis. Discus annuliformis. *Ovarium* integrum, 2-loculare ; stylus superne leviter incrassatus ; stigma cylindricum inter antherarum bases fovens ; ovula 2-seriata, 5–6 in quoque loculo. *Fructus* ignotus.

C. congolensis, *Stapf* (species unica).

Frutex scandens, glabberrimus, laticiferus. *Folia* late oblonga vel obovato-oblonga, abrupte in acumen lineare obtusiusculum contracta, 8–9 cm. longa, 3·5–4 cm. lata, coriacea, costa tenui supra canaliculata, nervis lateralibus tenuibus fere angulo recto patentibus utrinque ultra 20 ; petioli 10–12 mm. longi. *Cymae* pauciflorae, in paniculam 4 cm. longam, 2 cm. latam terminalem dispositae ; bracteae latae, breves ; pedicelli crassiusculi, angulati, plerique 2 mm. longi, nonnulli 5 mm. attingentes. *Calyx* 2·5 mm. diametro, segmentis duplo latioribus quam longis. *Corollae* tubus ultra 5 mm. longus, 2 mm. diametro ; limbus (haud explanatus) ut videtur tubo multo brevior. *Antherae* 3·5 mm. longae.

Congo Free State. *L. Pynaert.*

The material from which the description was drawn up was communicated by Dr. E. De Wildeman who suspected in it a new genus. The name *Cyclocotyla* is intended to allude to the fleshy shallow cup (κοτύλη), formed by the base of the calyx and the widening of the floral axis, and the ring-shaped (κύκλος) swelling by which this cup presents itself when seen from without.

946. **Faroa Wellmanii**, *Prain* [Gentianaceae-Chironieae]; species ex affinitate *F. salutaris*, Welw., a qua caule more *F. graveolentis*, Bak,, ramosa, et pedicellis puberulis manifeste differt.

Herba erecta. *Caulis* glaber, 8–18 cm. altus, ramis axillaribus subpatentibus numerosis nonnunquam iterum ramosis 6–8 cm. longis. *Folia* glabra, opposita, lanceolata vel oblanceolata, subacuta, basi attenuata, 1–2 cm. longa, 3–6 mm. lata. *Flores* in glomerulas 4–6 terminales axillaresque 1·25–1·5 cm. latas 1–1·25 cm. remotas aggregati, foliis per paria subduti ; pedicelli minute appresse puberuli, 3–4 mm. longi. *Calyx* 2·5 mm. longus, segmentis erectis ovatis acutis submembranaceis, nervo mediano viridi subincrassato extus versus apicem carinato. *Corollae* tubus 2·5 mm. longus ; lobi 2 mm. longi, lanceolati, acuti. *Filamenta* corollae segmentis longiora. *Stylus* 3·5 mm. longus, filiformis, stigmate minutissime 2-lobo.

Portuguese West Africa. Benguella ; Bailundo District, 1500 m., *Wellman.*

947. **Warpuria**, *Stapf*, gen. nov. [Acanthaceae-Barlerieae] ; a *Crabbea*, cui proxima staminibus aequalibus dissitis, antherarum loculis aequalibus, floribus pedicellatis et bracteolis quasi calyce exteriore cinctis differt.

Calyx hyalinus, 5-partitus, segmentis angustis 5, posticis 3 fere ad basin distinctis, anticis 2 ad medium connatis, caeterum subaequalibus. *Corollae tubus* subcylindricus, ad vel paulo supra medium constrictus, rectus ; limbus minutus, imbricatus, lobis 5 rotundatis, lateralibus exterioribus, antico intimo, superioribus alte connatis. *Stamina* 4, aequalia, paulo supra medium corollae tubum inserta ; filamenta dissita ; antherae oblongo-sagittatae, dorsifixae, loculis aequalibus muticis ; pollinis grana sphaerica, reticulato-foveolata. *Discus* annularis. *Ovarium* 2-loculare, loculis 2-ovulatis ; stylus filiformis ; stigma 2-labiatum, labiis rotundatis, supero majore. *Capsula* oblonga, tertia parte summa in rostrum solidum magis minusve contracta; valvae inter

margines laeves induratos convexae, transverse rugosae et medio transverse constrictae. *Semina* 4, lenticularia, sericea, retinaculis fulta.—Herba perennis, humilis, a basi ramosa, ramis brevibus. Folia opposita, approximata, integra vel subintegra. Flores minuti, albi, in cymas densas multifloras bracteatas haud involucratas capituliformes longe pedunculatas axillares collecti, pedicellati, unusquisque bracteolis 4 sub-herbaceis hirsutis calyce longioribus involucratus.

W. clandestina, *Stapf* (species unica).

Planta ad 12 cm. alta, pilosa caule brevi prostrato vel ascendente. *Folia* opposita, approximata, petiolata, oblonga vel oblongo-lanceolata, utrinque acuta vel subacuta, 6–7 cm. longa, 2–3 cm. lata, obscure repando-denticulata vel integra, supra cystolithis granoso-scaberula, in costa dense in nervis sparse in parenchymate sparsissime pilis albis adpressis aspersa, secundum costam vita lata lobata nigro-viridi notata, caeterum laete viridia subtus cinereo-viridia, ad costam et secundum margines dense ad nervos laxius in parenchymate sparse pilosa, nervis lateralibus utrinque circiter 7 obliquis ; petiolus circiter 1 cm. longus, tomentosus. Pedunculi 5–8 cm. longi, pilis declinatis densis canescentes ; capitulum 1·5–2·5 cm. diametro, omnibus partibus albo-pilosis, bracteis 2 linearibus herbaceis 1–1·2 cm. longis, 1 mm. latis suffultum, bracteis aliis similibus sed minoribus cum pedicellis mixtis ; pedicelli inaequilongi, longiores 5 mm. attingentes ; bracteolae involucrantes exteriores oblongae, subito in acumen latiusculum obtusum viride contractae, ad 7 mm. longae, albidae vel virescentes, venosae, interiores lineares, lanceolatae, 5–6 mm. longae. *Calyx* 2·5–3 mm. longus, segmentis e basi triangulari subulatis apice saepe pilo terminatis. *Corolla* 5-6 mm. longa, extus ad os pilosa ; limbus minutus, clausus, vix 1 mm. altus, lobis rotundatis. *Antherae* albae, ultra 1 mm. longae. *Ovarium* apice pilosulum ; stylus magis minusve tortus. *Capsula* 7 mm. longa, fere 2–5 mm. lata. *Semina* 2 mm. diametro.

MADAGASCAR. This remarkable little plant was raised at Kew in 1901 from seeds received from Mr. G. Warpur, who collected them in Madagascar. It has since flowered repeatedly at Kew and with Col. Beddome, but always produced cleistogamic flowers only which set freely.

948. **Selago nyikensis**, *Rolfe* [Selagineae] ; a *S. thyrsoidea*, Baker, foliis duplo minoribus et floribus multo minoribus differt.

Fruticulus compactus, 12–30 cm. altus. *Caules* puberuli, fastigiati, dense foliacei, ramosi. *Folia* oblongo-linearia, subobtusa, glabra, 8–12 mm. longa. *Spicae* breves, numerosae, ad apices ramorum dispositae, saepe congestae, densiflorae. *Bracteae* oblongae vel oblongo-lineares, obtusae, incurvae, 2–3 mm. longae, marginibus ciliatis. *Calyx* campanulatus, 5-partitus, villosus, 1·3 mm. longus ; lobi oblongi, subobtusi, ciliati. *Corollae* tubus oblongus, 1·5 mm. longus ; lobi inaequaliter orbiculari-oblongi, tubo aequales.

BRITISH CENTRAL AFRICA. Nyika Plateau, near Mwanemba, at 1950 m., *McClounie*, 39, "Flower blue" ; 40 "Flower white." September, 1902.

The two specimens cited are indistinguishable except in the colour of the flowers.

949. **Selago McClouniei**, *Rolfe* [Selagineae] ; affinis *S. tenuicauli*, Rolfe ; sed foliis paullo majoribus, minus pubescentibus et calycis lobis oblongis differt.

Fruticulus, 20–45 cm. altus. *Caules* pubescentes, foliacei, apice ramosi. *Folia* oblanceolata, subobtusa, prope apicem interdum denticulata, basi attenuata, 1–3 cm. longa, 2–5 mm. lata, puberula. *Cymae* corymbosae, densiflorae. *Bracteae* oblongae vel lanceolato-oblongae, subacutae, 2–2·5 mm. longae, marginibus interdum ciliatis. *Calyx* campanulatus, 5-fidus, 1·5 mm. longus ; lobi oblongi, obtusi, ciliati. *Corollae* tubus oblongus, 1 mm. longus ; lobi inaequaliter orbiculari-oblongi, tubo aequales. *Fructus* didymus, subglobosus, 1 mm. longus.

British Central Africa. Nymkowa, at 1950 m., *McClounie*, 57 ; Panda Peak, at 1500 m., *McClounie*, 139, September, 1902.

950. **Asplenium (Euasplenium) Elliottii**, *C. H. Wright* [Filices-Polypodiaceae] ; *A. anisophyllo*, Kunze, affine, pinnis brevioribus latioribus subintegris differt.

Caudex non visus. *Stipites* 12 cm. longi, glabri, tenues, straminei. *Frondes* lanceolati, simpliciter pinnati, 28 cm. longi, 10 cm. lati ; pinnae rhomboideae, acuminatae, minute crenulato-serratae, 5 cm. longae, 1·8 cm. latae, lamina superior basi truncata rhachide parallela, lamina inferior plus minusve obliqua ; venae (infimis exceptis) unifurcatae ; petiolulus ad 2 mm. longus. *Sori* 3–4 mm. longi.

British East Africa. Aberdare Range, at about 2800 m., *C. F. Elliott.*

The base of the lower side of the pinnae is much more obtuse than in *A. anisophyllum*, and is sometimes almost parallel to the rhachis.

XXXV.—TEO-NON, A NEW RUBBER TREE FROM TONKIN.

(*Bleekrodea tonkinensis*, Dub. & Eberh.).

Otto Stapf.

In the July number of last year of the *Bulletin Economique*, published by the Director of Agriculture, Forests and Commerce of Indo-China (pp. 576–585), Dr. Th. Eberhardt, Inspector of Agriculture, gave a detailed account of the occurrence of a valuable rubber tree in Tonkin, known to the Thôs people as "Teo-non." At the time it was not possible to define the systematic position of the plant beyond its affinity with *Ulmaceae*. Since then, however, it has been recognised as a member of the genus *Bleekrodea* (*Moraceae*) and has been described as *B. tonkinensis* by Dubard and Eberhardt in *Compt. Rend. Ac. d. Sc. Paris*, vol. CXIV., Oct. 1907, p. 631. The examination of a few branchlets of the plant, recently received at Kew from Dr. E. Perrot,

has confirmed the conclusions of the authors as to its affinity and specific distinction. The genus *Bleekrodea* has so far been known only from two species, one a native of Borneo (*B. insignis*, Bl.) and the other of North-West Madagascar (*B. madagascariensis*, Bl.). It has already been described by Blume as laticiferous, a character very general in *Moraceae*, but, so far as we know, there is no evidence of the presence of caoutchouc in the latex of the two species recorded by him. On the other hand, *B. tonkinensis* is stated to be very rich in caoutchouc and in this respect reminds us of another Moraceous genus, *Castilloa*.

The occurrence of a rubber-yielding tree in the forests of Tonkin was recorded as early as 1905 in a report by the commanding officer of the Cercle of That-Khe in the province of Bac-Kan. According to him it was known as ' May-ten-nong,' and attained a height of 10–12 m. with a diameter of 40 cm. The latex was abundant and was collected by the natives, whose attention seems to have been directed to the tree quite recently and accidentally ; in fact they used it only as an admixture to increase the bulk of rubber collected from other sources. Last year, however, Dr. Eberhardt was commissioned to investigate the properties of the tree on the spot and the conditions under which it grows. The following is the essence of his report.

The tree occurs practically all over the province of Bac-Kan (north of Hanoi, and half way between this town and the Chinese frontier), and in the adjoining southern parts of the Cercles of Bao-lanc and Cao-bang ; but Dr. Eberhardt is inclined to believe that it will be found throughout the mountainous districts to the north-west of the delta of the Red River and in the Laos country. In the province of Bac-Kan, it prefers hilly ground with a subsoil of calcareous schist and a deep covering of humus, which, however, must be fresh and well aerated and free from stagnant water. Where the soil is charged with clay, the 'teo-non' disappears completely, giving way to a vigorous growth of bamboos. It grows gregariously and may constitute as much as 40 per cent. of the vegetation. It is a rapid growing, much branched tree and attains a height of 12 to 15 m. The bark is thin and white, the wood white, soft and useless for joinery and carpentry. The mode of collecting the latex employed by the natives is very crude and wasteful. It consists in tapping the tree near its base by as many cuts as possible so that the normal flow of the latex is soon interrupted, whilst at the same time the tree is rapidly exhausted. Moreover, the product becomes in this way much contaminated with impurities. The latex is collected in the hollow joints of bamboos and carried to the nearest village or to some watercourse where the contents are poured into a pot containing water which is then heated to boiling point. Thus treated it forms into cakes, the impurities nearly always gathering in the centre. There are two seasons for collecting the latex, one before, and the other towards the end of the rainy season. The natives, however, generally confine their efforts to the latter time, when the flow is much more abundant. This is due to the increased activity of the organism and to the presence of a greater quantity of water in the latex, so that finally the amount of caoutchouc obtained is after all not greater at the end than just before the beginning of the

wet season. Similarly the trees on the outskirts of a 'teo-non' wood yield less but more concentrated latex. At the end of May Dr. Eberhardt obtained from a single tree of 20 cm. in diameter as much as 480 grammes of latex; but he thinks that in the autumn this tree might well have yielded 600–650 grammes. He recommends tapping at the base of the trees as the latex taken from the young parts does not coagulate. In this respect the 'teo-non' behaves like *Ficus* and *Castilloa*.

Dr. Eberhardt obtained 676·6 grammes of caoutchouc per kilogramme (or 67·6 per cent.) from two litres of latex. The best method of inducing coagulation was by means of sulphuric and hydrochloric acids; acetic acid seems to impair the natural cohesiveness of the caoutchouc globules. Heating directly over fire results in an inferior product; as it has to be continued until the serum is completely evaporated when a succession of thin and tough skins is formed which do not adhere to each other. On the other hand, the hot water bath gives excellent results. The treatment with sulphuric acid, however, seems to be by far the best process and the caoutchouc thus obtained is of first-rate quality, very strong (nerveux), resistant and elastic. Mr. Cibot, an expert in American rubber and in the rubber industry generally, states that the 'teo-non' rubber is equivalent to Para and practically indistinguishable from it. A native-made cake of 'teo-non' rubber was, in fact, awarded a gold medal at the French Colonial Exhibition at Marseilles in 1906, in spite of the usual impurities present in the native article.

A score of young plants are at present in cultivation in the Botanic Garden at Hanoi. Only one member of the small subtribe *Fatoueae*, to which *Bleekrodea* belongs, has been found up to the present in India, viz.: *Pseudostreblus indica*, Bur., a small tree of the Khasia Hills; but between them and Tonkin, there must be many localities where the 'teo-non' could be grown with success if it should be found that its natural area does not extend into British territory.

The following description is based on the specimens received from Dr. Perrot, and supplemented from the description given by Messrs. Dubard and Eberhardt:—

A tree, 30–50 feet high, copiously branched, with whitish lenticellate bark and white wood; branchlets scaberulous from acute, white, rigid papillae. *Leaves* very polymorphic, obovate-oblong to oblanceolate or lanceolate, abruptly contracted into a slender acumen, 2½–6 lin. long, cuneate at the base, usually more or less dentate, sometimes with three coarse teeth on each side between the middle and the acumen, rarely almost entire, 2–6 ins. by ⅘–1½ ins., lateral nerves 5–10 on each side, curved, joined in loops within the margin, very slender, network of veins very loose; petioles slender, very scabrid from white rigid papillae, ¾–2 lin. long. *Flowers* monoecious, in small axillary, uni- or bi-sexual cymes; male cymes forming small compact globose clusters of 6–9 flowers, sessile or subsessile, bracteate; bracts and bractlets obtuse, the outer broad, the inner narrow, as long as or shorter than the subsessile flowers; female cymes subsessile or shortly peduncled, reduced to a female flower, embraced to the apex by two broad ovate or elliptic, obtuse, scaberulous, bracteoles,

situated in the median plane, and supported by two smalier alternating bracteoles, and a somewhat larger outer bract, with or without rudimentary male flowers in the axils of the inner bracts; mixed (bisexual cymes) like the male cymes, but with a female flower in the centre. *Male flowers:* perianth 4–5-lobed, lobes triangular-ovate, scarcely ½ lin. long; stamens 4–5, opposite the perianth-lobes; filaments inflexed in bud, rising elastically; anthers subglobose; ovary rudimentary, minute. *Female flowers:* perianth shortly ovoid-tubular, with a small almost truncate or minutely 4-toothed orifice, ½ lin. long, scaberulous; ovary subglobose; style sublateral; stigmas filiform, 3–3½ mm. long. *Fruit* (immature) of the size of a pea, formed of a one-seeded achene, surrounded by the fleshy enlarged perianth and supported by the equally enlarged bracteoles; embryo subglobose; cotyledons subequal, thick; radicle incumbent.

Of three branchlets received from Dr. Perrot, two possess only male clusters, the third only female cymes with or without rudiments of male flowers. Dr. Eberhardt, on the other hand, says that the male and female inflorescences alternate, whilst his and Dubard's description in the *Comptes Rendus*, l.c., admits male and mixed clusters on the same branch.

XXXVI.—MISCELLANEOUS NOTES.

Amherstia nobilis.—There is a good example of this handsome tropical tree in the Aroid house (No. 1) at Kew where it has been for at least 30 years. Until about 10 years ago it was planted in a tub, but since then it has been in the open border the soil in which receives a certain amount of heat from the boiler chamber immediately below. This plant is 25 feet high and has a stem 6 inches in diameter with loosely spreading branches. It has flowered more or less freely every year since it was planted out, and this year it has been exceptionally floriferous, carrying 82 large pendulous racemes of bright scarlet and yellow flowers which were at their best early in June. *Amherstia* was first introduced from Burma into English gardens through Chatsworth about 60 years ago, and was first flowered in a garden at Ealing in 1849. The Kew tree is probably about 40 years old. In Burma there are trees 40 to 50 feet high and when in flower they are said to be magnificent, and one of the features of the Royal Botanic Garden at Calcutta is an avenue of these trees. The flowers are used by the Burmese in connection with their religious ceremonies.

W. W.

Agaves at Kew.—The cultivated collection of Agaves at Kew is an exceptionally large one and there are nearly always some of them in flower. The tradition that *A. americana* the "American Aloe" flowers only once in a hundred years sometimes gives rise to excitement in the daily press when it is seen that some of these "century plants," as they are popularly termed, are in bloom at Kew, with the result that many visitors are disappointed when

they learn that the flowering of these plants is quite a common occurrence at the Royal Gardens. The age at which an *Agave* will flower depends largely upon the conditions under which it has grown; happily situated it may flower when 10 years old ; on the other hand, if the conditions are unfavourable to healthy quick growth, it may take 20, 50, or even a hundred years, or it may never flower at all. The species that have flowered at Kew this year are the following :—*A. Leopoldii*, flower spike 14 feet high ; *A. micrantha picta*, $2\frac{1}{2}$ feet ; *A. horrida macrodonta*, $7\frac{1}{2}$ feet ; *A. Polyacantha*, $4\frac{1}{2}$ feet ; *A. Bouchiei*, $2\frac{1}{2}$ feet ; *A. densiflora*, 5 feet ; *A. Scolymus*, 8 feet ; *A. Haseloffii*, 3 feet.

W. W.

Presentations to Museums.—Among recent presentations to the Museums may be mentioned the following :—Roots of *Mesembryanthemum acutipetala*, used by natives of the Transvaal for the preparation of "Khadi," a fermented liquor ; received from Mr. J. Burtt Davy, Department of Agriculture, Transvaal.

Leaves of *Fagus obliqua*, *Aristotelia Macqui* (*Kew Bulletin*, No. 38, 1890, p. 34), and *Persea Lingue*, eaten by leaf-cutting bees in Chili ; presented by Mr. R. Morton Middleton, F.Z.S.

Branch of *Pinus muricata*, portion of stem and plank of *Pinus Coulteri*, planks of *Ailanthus glandulosa*, *Laburnum vulgare*, *Taxus baccata*, *Pinus Laricio and Quercus Robur*, also section of Oak in which a horse shoe has become embedded ; presented by Mr. H. Clinton Baker, Bayfordbury, Herts.

Section of a Beech log and portion of an Oak pile from the foundations of Winchester Cathedral. The former was taken from under Bishop de Lacy's work, A.D. 1202, and the latter was found under the early Norman work, A.D. 1079 ; received from the Very Rev. the Dean of Winchester through the kind offices of Mr. Francis Fox, C.E.

Photographs showing the effects of the storm upon the Lime and Horse Chestnut trees in Bushey Park on June 1st, 1908; from Mr. W. Haine, Teddington.

J. M. H.

Kapiti Island—The action of the New Zealand Government in setting apart areas throughout the length and breadth of the Colony for the protection of the native animal and plant life cannot be too highly commended. Their most important action, however, from the scientific point of view is the acquisition of three islands, which are to be maintained as sanctuaries for plants and animals. The three islands, which are of quite different character, are Little Barrier Island in the Hauraki Gulf, an island densely covered with forest similar to that of Northern Auckland ; Resolution Island, with a vegetation typical of the West Coast Sounds, with dense forest and high alpine flora not yet properly investigated ; and Kapiti Island which forms the subject of a very instructive and well-illustrated report recently presented by Dr. L. Cockayne to the New Zealand Government.

In its flora Kapiti Island is closely related to the neighbouring mainland of Wellington on the one hand and Marlborough on the other, but at the same time shews certain peculiar characteristics. The island has an area of 4,990 acres and on its western side it is one huge precipice rising to a height of as much as 1,700 feet above the sea. The steep slopes of the eastern side are covered with forest, and at the northern end there is an extensive boulder flat with a small fresh-water lagoon ; there are also numerous rivers. Kapiti has been a famous whaling station and various weeds have, in consequence, been introduced into the island ; moreover the whalers introduced goats, the descendants of which exist in great numbers. Then sheep farming was introduced, and sheep have pastured on the island for about 50 years. Between sheep and goats a great deal of destruction must have been done to native vegetation, and it is to be hoped that these and other introduced animals will be removed in order that the native fauna and flora may be left in undisputed possession of the island. The melancholy history of St. Helena should be a sufficient example of the irreparable destruction which may be caused to an indigenous flora by the introduction of foreign animals. Foreign weeds, too, appear to have modified the local flora of Kapiti to a considerable extent, but apparently the forest is free from such dangerous intruders as the Blackberry and Elderberry.

Dr. Cockayne devotes several pages of his report to descriptions of the various plant formations, which are well illustrated by the photographs, and he divides these formations into forest, coastal, shrubbery, meadow and rock. The forest is of the mixed type and in certain respects shows a coastal character ; it is composed of trees of low growth, which, however, possess definite trunks. The Karaka, *Corynocarpus laevigata ;* Mahoe, *Melicytus ramiflorus ;* Ngaio, *Myoporum laetum* and the Manaku, *Leptospermum scoparium*, largely determine the character of the forest and may be recognised by the characteristic tints of their different greens, which in October are lit up by the white masses of the flowers of the daisy-tree, *Olearia Cunninghamii.* The second tier in the forest, if present, usually consists of young trees of the same species as those composing the forest and not of distinct shrubs, which is somewhat unusual ; in places, however, various tree ferns and a few shrubs may be found, chief amongst which are the Tawa, *Beilschmiedia tawa*, and the northern Rata, *Metrosideros robusta.* The forest floor is frequently quite bare, a distinction from the New Zealand rain forest, but at other places, especially where the covering is less dense, there is a close carpeting of various ferns.

The leading plants of the forest are dealt with in detail, and the oecological factors and the general distribution of the species are also discussed.

The shrub formation is characterised by *Cassinia leptophylla* mixed with *Leptospermum scoparium* (Manaku) and *Olearia Solandri* in smaller quantity ; in the more open places various grasses are also to be found. The Manaku heath is one of the commonest of the New Zealand formations and might almost be classed as forest. In Kapiti it is continuous with the forest, and is an expression of the more stony nature of the ground and the less fertile soil. At the head of a small stream, the Tapeiro, in a very

wind-swept spot, a remarkable xerophytic scrub formed by *Nothopanax anomalum* is to be found. The bushes are from 2–4 feet high and so dense that one can stand upon them and, as they touch one another, a raised platform is formed of interlacing rigid stems whose apical portions have almost turned into spines. In places the lianes *Muehlenbeckia australis* and *Parsonsia heterophylla* are fairly abundant and help to bind the shrubs more closely together.

The other formations are also dealt with in considerable detail.

The flora of Kapiti consists of 218 species of flowering plants, ferns and fern allies, of which 43 belong to the two latter groups. It is characteristic of the central region of New Zealand being allied to the flora of the southern portion of the North Island and the northern portion of the South Island. The general affinities of the flora and the geological history of the island are also considered.

As a plant and animal sanctuary Kapiti appears to be peculiarly well suited, as, although it is of small extent, it is so much cut up by deep and precipitous gullies that a great part of the Island is very difficult of access. It is to be hoped that the whole of the island will be acquired by the Government so that it may become a safe home for the endemic fauna and flora of New Zealand, and that other New Zealand plants and trees, not already on the island, may also be introduced.

Dr. Cockayne's report concludes with a list of the indigenous plants with their English and Maori names together with notes on their distribution on Kapiti and in and beyond New Zealand.

In this connection of Flora and Fauna Reserves it is of interest to notice that the various scientific societies of South Australia are proposing to set apart 313 square miles of country at the western end of Kangaroo Island lying to the south of Spencer Gulf, and a short illustrated account of the island is given in "The Adelaide Observer" for February 1st, 1908.

Zapupe.—In *Der Tropenflanzer*, No. 4, April, 1908, Dr. Endlicher contributes an article on the 'Zapupe' cultivation in Mexico (*K.B.*, 1907, p. 396). From his observations it would appear that the 'Zapupe' of the Mexican littoral from Vera Cruz to Tampico is not derived from any single plant, and further the article leads to a conjecture that the sources of commercial 'Zapupe' as reported from the more southerly markets in the Vera Cruz tract may lie partly to the south of Vera Cruz, though this is not perfectly clear. In other words the term 'Zapupe,' like 'Istle,' may cover more than one staple, and the fibres that come into the coast markets under that title may be derived from different plants not necessarily all belonging to the *Agaveae*. In fact, it seems likely that the narrow-leaved 'Zapupe' plant, mentioned by Dr. Endlicher, may be a Bromeliad, unless it should turn out to be the long-sought *Agave cantala*, Roxb.

J. R. D.

"DIE-BACK" OF PEACH SHOOTS.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7.] [1908.

XXXVII.—"DIE-BACK" OF PEACH SHOOTS.

G. Massee.

About 58,000 species of fungi have been described, and of this number at least 10,000 are placed by mycologists under the heading "Fungi imperfecti," on the assumption that such are in reality nothing more than stages in the life-cycle of species of the higher fungi, belonging to the Phycomycetes, Ascomycetes, and Basidiomycetes respectively. This line of reasoning is supported by the fact that in many instances such relationship has, by means of pure cultures, been proved to exist. There remain, however, many thousands of these forms that have not yet been connected with any of the higher species, and as it is important both from a scientific and economic standpoint that such should be accurately described, they are grouped under "form-genera" and "form-species," thus implying that they are stages which have not as yet been connected with higher species.

Such form-species or conidial stages are unknown in connection with the primitive species of aquatic fungi, and were only evolved as supplementary stages when the fungi passed from their original aquatic habitat and established themselves on dry land. These conidial stages possess many features in common. They are all asexual in origin. The conidia are produced in immense numbers and in rapid succession throughout that portion of the season when the host of the fungus is in active growth. The conidia germinate at once when mature, and being dispersed wholesale by wind, birds, insects, &c., are constantly infecting new hosts. In fact, the special function of conidia is to extend the geographical area of the species, while the spores of the original or higher form of the species, which require a period of rest before they are capable of germinating, are only concerned with the survival of the species in time, by tiding it over that period when the host is not in a condition to furnish food for the fungus.

From the above account it will be seen that the conidial form of a fungus is invariably the cause of an epidemic or of a rapid spread of a disease, except in those instances where even this method has been superseded by the presence of hybernating mycelium in

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the host plant. Conidial forms as a rule are rampant parasites, whereas the primitive or sexual stage of the same fungus is usually a saprophyte, and only appears when the host is on the wane, if not quite dead.

The members of the *Peronosporeae* illustrate the gradual transition of a primitive group of fungi from an aquatic to an aerial habitat. The sexual and oldest stage of the fungus as yet retains so much of its original nature that the reproductive bodies take the form of zoospores, whose only mode of dissemination is by means of water, which obviously limits their dispersion on land. By the addition, however, of a conidial stage, whose reproductive bodies are dispersed by wind, animals, insects, &c., the various members of the *Peronosporeae* have been enabled to extend the area of their distribution to the utmost limits of range of the hosts to which they have become adapted.

The parasite which causes the disease about to be considered presumably belongs to the category of "form-species," but as yet there is no direct evidence on the point, since pure cultures of the conidia have hitherto failed to produce any other form of fruit. The fungus is called *Naemospora crocea*, Sacc., and belongs to the family *Melanconieae*, which is characterised more especially by the absence of a definite perithecium or fruit enclosing the reproductive bodies or conidia.

During the past few years numerous inquiries have been addressed to Kew respecting the disease, aptly termed by one correspondent as "die-back of two-year-old peach shoots."

In the spring the leaf-buds expand normally, without any suggestion of disease, but just about the time when the blossom is fully expanded the young leaves suddenly wilt, turn brown, and die within a few days. At the same time the petals change to a rusty brown colour and the flowers droop, but remain attached to the branch for some time, as also do the leaves. Finally the shoots bearing diseased leaves and flowers assume a deep claret-red colour, and shrivel more or less as the season advances.

The above are the distinctive and unvarying naked-eye characteristics of the disease under consideration. About midsummer, when the dead leaves and flowers have been removed by wind and rain, trees that have been badly diseased can be recognised by the presence of numerous naked shoots, varying from one to two feet in length. During the months of May and June of the following year these dead branches, if carefully examined, will be found to be more or less thickly studded with minute, dull-orange-coloured, tendril-like bodies, consisting of myriads of spores of a parasitic fungus.

If a section is taken through a branch at the point where such a tendril-like body is protruding, the fungus will be seen to consist of a more or less depressed sphere situated in the cortex. These spheres, which are quite numerous, consist at first of a minute, solid mass of mycelium, which gradually increases in size, becomes hollow, and is eventually lined with closely-packed, slender threads or sporophores, which originate from the cells forming the inside wall of the sphere, with their free tips projecting into the cavity of the fruiting body. The minute spores are

produced in rapid succession from the tips of the sporophores, and soon fill the cavity of the fruiting body, which now begins to indicate its position by a slight wart-like protuberance under the epidermis of the host plant. When the fruiting body of the fungus is replete with spores, the sporophores deliquesce and form a highly hygroscopic substance, which increases very considerably in volume when in contact with water. This peculiar property of the disintegrated sporophore-material enables the spores to escape from the fruiting body into the air.

When the spores are mature and the sporophores have deliquesced, the whole are extruded from the fruit through a rupture in the epidermis caused by the increasing pressure of the spore-mass. This extrusion takes the form of tendrils, consisting of myriads of spores immersed in mucilage, and takes place after a shower of rain, the water causing the mucilage to swell to a remarkable extent. At the moment of extrusion these tendril-like bodies are very soft and gelatinous, but they commence to dry and harden the moment they come into contact with the air, and in the act of drying usually become spirally coiled and variously contorted. The extrusion of the entire mass contained in a spore-cavity usually occupies about five minutes. In dry weather the tendrils are rigid and horny, but they become soft and glairy when moistened with rain or dew. These spore-masses are not dispersed by wind, but depend for their dissemination to a great extent on birds, who convey the spores when moist and gelatinous from diseased to healthy shoots by means of their feet.

The shoots are only capable of infection while quite young, but when the mycelium has gained an entrance into the tissues it spreads rapidly and infects the entire growth of the season. Four shoots infected respectively at one point only, when three inches long, and protected from the visits of birds by netting until the end of the year, were found the following year to be infected throughout their entire length—about 15 inches—and produced numerous tendril-like masses of spores. In another experiment a branch bearing six shoots was selected; three of the shoots were infected with spores, whilst the remaining three were left uninfected as controls. All these shoots were protected by netting, and the following year the three infected shoots were badly diseased, while the uninfected control shoots remained healthy. No success attended the many attempts to infect branches more than one year old, not even when spores were placed in a wound made in the cortex.

The spores do not retain their power of germination for more than about three months.

Description of the Figures.

1. A two-year-old shoot showing the first symptoms of disease. Nat. size.
2. A dead shoot showing the tendrils of spores. Nat. size.
3. Section of cortex of a diseased shoot, showing spore-conceptacles and tendrils of spores. Slightly mag.
4. Portion of a tendril showing the spores imbedded in mucus. Mag.
5. Spores, some germinating. Highly mag.

XXXVIII.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: VIII.

I.—MACRO-LEPIDOPTERA

(with Tortricina).

A. Langley Simmons.

The collection of insects belonging to this order progressed steadily during the past year, but the climatic conditions which generally prevailed were anything but favourable to good work. There has not been a season for a great number of years which has been so wholly disappointing, and this scarcity of insects was apparent throughout Great Britain. It is difficult to find a reason for this, even allowing for cold winds in the early summer, and retarded vegetation. The autumn species, especially the *Noctuidae*, were singularly scarce, and all the ordinary baits generally used for their capture were ineffective. Much work has to be done yet to discover the causes which make insects plentiful in one year and scarce in another; it is a subject of which really little is known.

In spite of the conditions referred to, however, the records made are extremely interesting, and in the case of *Deilephila euphorbiae*, probably unique. With the two previously published lists, the record is becoming a valuable one, and it is not yet by any means exhausted. The whole of the following records were made between February and November, 1907.

RHOPALOCERA.

Papilionidae.

Papilio machaon, *L.*—"The swallow-tail butterfly."

One specimen was taken on the wing in the Palace grounds, by H. J. Burgess. As this butterfly is now only found in the fens of Norfolk, Cambridge, and Hunts., it is probable that the one captured had been allowed to escape by a collector who had been breeding them. They are found all over the world, except Australasia, four species existing in Europe. The larvae feed on *Peucedanum*, *Heracleum*, *Angelica*, &c.

HETEROCERA.

NOTODONTINA.

Sphingidae.

Sphinx pinastri, *L.*—"The Pine Hawk moth."

One pupa was found under a Scotch Pine (*Pinus sylvestris*) in February, by Reginald A. Simmons. It remained very lively for some months in confinement, but failed to emerge. The pupa was opened and examined by Mr. W. J. Lucas, and proved to be undoubtedly *S. pinastri*. The discovery of this insect at Kew is

of course interesting, as it is regarded as a scarce casual only. It is, however, believed to have established itself in a small locality in Suffolk and in Kent. It is general in Northern Europe and North America, on *Picea excelsa* and *Pinus sylvestris*. At times the larvae cause immense destruction to these trees on the Continent and in North America.

Deilephila euphorbiae, *L.*—"Spurge Hawk moth."

The finding of two pupae by Mr. G. Nicholson and the writer in March of last year is probably the most interesting discovery yet made among the lepidoptera existing in the Gardens. This beautiful moth is extremely rare in Great Britain, being a very occasional immigrant only. The pupae were found under an oak tree in the quietest spot in Q.C., quite close to the surface, about nine inches from the trunk, facing N.E., and were in earth cocoons. The imagines put in an appearance in June, one proving to be a beautiful variety. Dr. Chapman states that on the Continent they are subject to great variation in their markings. The food plants are generally given as *Euphorbia Paralias* and *E. Cyparissias*, but as neither of these plants is found within half a mile of where the pupae were dug, it is only fair to assume the larvae existed on some other plant not yet noticed. The moth has a wide distribution abroad, being found in C. and E. Europe, N. Africa and Asia, to the Himalayas. The two moths under notice were recorded in the *Entomologist* for August, 1907.

D. porcellus, *L.*—"Small Elephant Hawk moth."

One specimen captured by Stanley Goodwin as late as the end of August, outside the Garden walls. Fairly well distributed throughout Great Britain, Europe, and Central Asia. On Bedstraws.

TRIFIDAE.

NOCTUIDAE.

Leucania straminea, *Tr.*—"The streaked wainscot."

One specimen taken by the lake. Found in the Southern and Eastern English counties, and N. and C. Europe. Not common. On *Phragmites*.

Hadena pisi, *L.*—"Broom moth."

Common throughout Great Britain and N. Europe. On *Pteris*, *Cytisus*, *Scabiosa*.

H. genistae, *Bkh.*—"The light brocade."

Common in England, local in Scotland and Ireland; C. Europe and N. Asia. On *Genistae*, *Polygonum*, *Stellaria*.

Apamea fibrosa, *Hb.* (*leucostigma*, Hb.).—"The crescent rustic."

Two specimens taken in Kew. Found locally all over Great Britain; C. Europe and N. Asia. Larvae feed in the flower stems of yellow flag.

Agrotis cinerea, *Hb.*—"The light feathered rustic."

Found generally throughout England and Scotland, not Ireland; C. and N.W. Europe and Asia Minor. On *Thymus*, *Rumex*, &c.

Noctua baja, *F.*—"Dotted clay."

Taken at treacle. A common moth found throughout Great Britain; Europe, Asia, and N. America. On *Salix* and *Primula*.

Toeniocampa instabilis, *Esp.* (*incerta*, Hufn.).—"The clouded drab."

One of our commonest moths, found all over Great Britain; N. Europe and N. Asia. On oak, poplar, hawthorn, willow, &c.

GEOMETRIDAE.

Boarmidae.

Already recorded in *Kew Bull. Add. Series* V., 1906, p. 40 (under *Biston hirtaria* L.).

Biston hirtaria, *Cl.*—"Brindled Beauty."

One specimen taken. Not a common insect. Found in the Southern and Midland counties of England and in N. and C. Europe. It is believed that with this species the male is sought by the female, contrary to the usual rule. On oak, elm, ash, lime, and fruit trees.

Hybernia defoliaria, *L.*

A common insect found all over Great Britain, N. Europe and N. Asia. The female is apterous. On oak, beech, hawthorn, &c.

Lasiocampidae.

Bombyx neustria, *L.*—"The lackey moth."

Confined to England, S. and M. counties; Europe and N.W. Asia. On hawthorn, blackthorn, and fruit trees. At times a pest in the orchards, but not so plentiful as formerly.

Bupalus pinaria, *L.*—"The bordered white."

One specimen, taken by Mr. G. Massee. Common in Great Britain wherever pine woods exist; also in N. Europe and N.E. Asia. On *Pinus sylvestris* and larch.

Pericallia syringaria, *L.*—"Lilac beauty."

Common to England only, Europe and N. Asia. On *Ligustrum* and *Lonicera*.

Ennomos angularia, *Bkh.* (*quercinaria*, Hufn.).—"The August thorn."

A batch of ova taken by Mr. Sich in Palace grounds. They fed up, pupated, and emerged in July. Some of the moths were extremely dark, being deeply strigulated with dark fuscous. Common in England, scarce in Scotland, not found in Ireland; also in C. Europe. On birch, beech, oak, and ash.

Panagra petraria, *Hb.*—"Brown silver lines."

Common to Great Britain wherever bracken abounds; C. Europe and across Asia to Japan. On *Pteris aquilina*.

Scotosia certata, *Hb.*—"The tissue."

Taken by Mr. T. Nicholson. Common in the S. and M. Counties of England; C. Europe and W.C. Asia, Persia, and Japan. On *Berberis*.

PYRALIDINA.

SCOPARIIDAE.

Scoparia crataegella, *Hb.*

A common little moth found throughout Great Britain and C. Europe. On mosses.

SESIA.

Trochilium tipuliformis, *L.*—"The currant clear-wing."

Although diligently searched for, this and the following species are the only clear-wings yet observed in the Gardens. Mr. G. Massee took the specimen in Q. All the species are diurnal, with a rapid flight. The wings are only partially covered with scales. *T. tipuliformis* is the commonest member of the family, and feeds on branches and twigs of currant, particularly *Ribes nigrum*. It is found in England and Scotland, and is practically cosmopolitan, having been introduced artificially to Australasia.

T. myopaeformis, *Bkh.*—"Apple clear-wing."

Several empty pupa-cases found protruding from the bark of apple trees by Mr. G. Nicholson and Mr. Sich in P., in August.

TORTRICINA.

EPIBLEMIDAE.

Eucosma betuletana, *Hw.*—"The birch tortrix."

Common throughout Great Britain and Europe. On birch.

E. bifasciana, *Hw.*

One taken in A. A local species in England.

E. striana, *Schiff.*

Generally throughout Great Britain and Europe. In roots of *Taraxacum*.

Hedya lariciana, *Zell.*

One bred from larch. This species is considered by some to be a form of *H. ocellana*, Fab., already recorded.

Ancylis lundana, *F.*

An extremely common little moth. Found all over Great Britain and the N. Hemisphere. On *Vicia*, *Lathyrus*, &c.

Coccyx tedella, *Cl.*—"Pine silver-barred tortrix."

Very common throughout Great Britain and Europe. On *Picea excelsa*.

Epiblema solandriana, *L.*

Common to Great Britain and N. and C. Europe. On hazel, birch, and *Salix caprea*.

E. bilunana, *Hw.*

On birch in A. Common in Britain and C. Europe.

Pammene regiana, *Z.*—"Yellow blotch back."

Common in the S. of England and E. Ireland; C. Europe and Asia Minor. Larva feeds beneath the bark of sycamore.

Hemimene petiverella, *L.*

A very common species, attached to *Tanacetum*.

H. simpliciana, *Hw.* (*caliginosana*, Tr.).—"Plain silver-fringed tortrix."

S. and M. Counties of England and Ireland. Not common. Also in Holland and Germany. In rootstocks of *Artemisia vulgaris*.

TORTRICIDAE.

Acalla aspersana, *Hb.*—"The red rough-wing tortrix."

Locally plentiful. Great Britain and C. Europe. On *Spiraea*, *Poterium*, &c.

Teras caudana, *F.*—"The notch-wing tortrix."

Common to Great Britain, Europe, and N. America. On *Salix*.

Dichelia grotiana, *F.*—"The groatian tortrix."

Local in the S. and M. English Counties, also C. Europe. Food plant unknown.

Cacoecia lecheana, *L.*

One bred from larch. A common species attached to various trees.

Retina buoliana (*Schiff*) was recorded in the last list, but it is mentioned again in this to draw attention to the damage done to pine trees in the early summer by these destructive larvae. The ends of the branches and shoots were buttoned and aborted, greatly disfiguring the trees, and the larvae seemed to be more than commonly plentiful.

II.—MICRO-LEPIDOPTERA.

ALFRED SICH.

The summer of 1907 was too damp and cold to be very favourable to the Micro-Lepidoptera; but, as regards the Tineina, a very fair number of additions were made. Some of these have already been published in the *Kew Bulletin* (No. 5, 1907), and it now remains to record those additional species which have been observed since that publication was issued. Although *Tinea cloacella* has already been recorded as an inhabitant of the Gardens, it may be of interest to note that no less than fifteen of these prettily mottled insects were found by Mr. G. Nicholson and

myself at rest on an old Lime tree in the Palace Grounds on June 12 last. *Fomes fomentarius*, Fries, was growing from the tree, and this fungus had evidently served as food for the tineid larvae, as a pupa case was found protruding from the upper surface of the fungus.

Cemiostoma (*Leucoptera*) *spartifoliella* was in great abundance, and Mr. G. Nicholson is of opinion that, small as the insect is, it must certainly be considered destructive. The larvae which feed from September to May, eat out serpentine galleries beneath the bark of the Broom (*Cytisus scoparius*). When full fed, they bore through the bark, and then spin a thick white silken cocoon on the outside of the bark. During this period of their lives, they are therefore well protected, and it is difficult to devise means for their destruction. Possibly spraying the Broom bushes with some noxious compound, such as soft soap with paraffin, several times during the period when the moths are on the wing in June and July, might serve to decrease their numbers. In May and June the conspicuous white cocoons might be scraped off the bark and destroyed, but this process would be very tedious.

On the 15th of April Mr. Nicholson handed me two larvae of a Tortricid moth (probably those of *Capua angustiorana*). Adhering to each was an Hymenopterous parasitic larva. These parasites continued their existence, lying on the backs of their hosts, and when full fed, left the shrivelled skins of their victims and spun slight cocoons. When the winged insects appeared, they were sent to Mr. Claude Morley, who kindly identified them as a pair of *Oedematopsis scabriculus*, Grav., adding that the attacks of this species appear to be confined to the *Tortricidae*.

The larvae of Lepidoptera are frequently attacked by Hymenopterous and Dipterous parasites, but in most cases these remain hidden in the bodies of their hosts until full fed.

TINEINA.

YPONOMEUTIDAE.

Swammerdamia caesiella, *Hüb.*

One taken by Mr. A. L. Simmons.

S. pyrella, *Vill.*

This pretty little species is common about the hawthorn in Q., in spring, and is also not rare on the stems of apple trees in P.

Argyresthia glaucinella, *Zell.*

One taken by Mr. A. L. Simmons. This is a local insect. The larva is said to feed in the bark of oaks and chestnuts.

A. semitestacella, *Curt.*

One specimen. This is attached to the beech, and is doubtless common in A.

A. retinella, *Zell.*

Not rare in Q. among the birches, in the shoots of which the larva feeds.

A. cornella, *F.*

Common on stems of apple in P.

A. goedartella, *L.*

Occurs in A. It is probably common on most of the birch trees in the Gardens. The larvae live in the catkins in spring, and by their burrowings cause the catkins to bend and twist. If a twisted catkin be carefully opened, the larva may be found inside. They leave the burrow to pupate. The moth is beautiful, being white with golden-red bars, or sometimes entirely golden.

A. brockeella, *Hüb.*

Occurs with the preceding species in A., but is not quite so abundant.

Cedestis farinatella, *Dup.*

Two specimens from *Pinus Laricio*, in A. Its usual food is *Pinus sylvestris*, in the needles of which the larva mines.

Plutellidae.

Cerostoma vittella, *L.*

Mr. Nicholson found one specimen on a lime in P. It is doubtless common on the elms in the gardens.

Gelechiadae.

Bryotropha terrella, *Hb.*

Not rare in Q. Generally very common in meadows in June and July. Variable in ground-colour.

Gelechia pinguinella, *Tr.*

Local. Taken by Mr. A. L. Simmons. Occurs sometimes in numbers on bark of *Populus nigra.*

G. rhombella, *Schiff.*

Found by Mr. Nicholson on bark of apple trees in P. It has the habit of hiding itself under the flakes of the bark, and from its dull colour is easily overlooked.

G. mulinella, *Zell.*

Common in A. Common among *Ulex* and *Cytisus*. The larva feeds in the flowers of these plants.

Lita costella, *Westw.*

Taken by Mr. A. L. Simmons. The larva is attached to *Solanum Dulcamara*, and is equally at home, whether mining in the leaves or stem, or living between the young leaves spun together, or even in the berries.

L. maculiferella, *Dgl.*

Not rare in the Gardens. This is a local species, but has for many years been taken in the London district.

Aristotelia ericinella, *Dup.*

On *Calluna* in A. This beautiful species must not be confounded with *Gelechia ericetella*, Hüb., previously recorded. It is generally common on heaths in August.

Oecophoridae.

Depressaria costosa, *Haw.*

On *Ulex* in A. Common in most places where its food-plants grow (*Ulex*, *Cytisus*).

Borkhausenia augustella, *Hüb.*

Two specimens taken in Q. It is somewhat local, but quite a Londoner, as it has been taken in Hyde Park.

B. lunaris, *Haw.*

A handsome little insect. Taken in P. The larva lives probably in decaying wood.

Elachistidae.

Batrachedra praeangusta, *Haw.*

In A. This is a singular insect, the forewings being very elongate. It sits on the bark of poplar trees with its head raised, thus bearing a somewhat fanciful resemblance to a frog.

Blastodacna hellerella, *Dup.*

A typical specimen was taken by Mr. Nicholson near hawthorn, in Q., in July, where it probably is not rare. Another very dark specimen was captured on an apple trunk, near a hawthorn hedge in P., in August. This dark specimen certainly approaches *B. vinolentella*, H.–S., but does not quite agree with the description of that species, and may therefore rather be considered as another of those dark forms of Lepidoptera which occur in the London District.

Mompha stephensi, *Stn.*

This is usually considered a local species, and is mostly taken on the trunks of trees. Three specimens, one on an alder near the lake.

Heliozela stanneella, *F. R.*

This minute species sometimes flies in little swarms in the sunshine. Mr. Nicholson discovered a swarm hovering over the twigs of a yew in the Gardens last May. There was an oak close by which had doubtless served the larvae as food.

Coleophora juncicolella, *Stn.*

This is probably quite common on the ling in the Gardens, as it was readily obtained each time it was sought. The larval case is minute, and so exactly like a terminal bud of the ling that it can scarcely be detected unless the larva be in motion. It may be obtained by shaking the ling over an inverted umbrella and patiently watching till the larvae crawl out of the débris. On one occasion while thus employed Mr. Nicholson detected a scale, new to the Gardens.

C. badiipennella, *Dup.*

Much more common than the following species, on elm. The first larva noticed was on Queen Elizabeth's elm.

C. limosipennella, *Dup.*

Does not appear common in the Gardens. A few cases taken off elm in P.

C. gryphipennella, *Bouché.*

This is rather common on various roses in the Gardens. The larva makes whitish blotches in the rose leaves, but as it prefers the more hidden parts of the bushes the blotches are not so conspicuous as they might otherwise be.

C. bicolorella, *Stn.*

Common in the Gardens on several trees, among others on *Alnus firma*, and Mr. Nicholson found it on purple hazel. The larva hybernates in a small brown case, but in the spring it adds a larger piece of green leaf, making thus a case of two colours, hence the specific name.

C. paripennella, *Zell.*

Cases containing young larvae were taken in A. off *Corylus Colurna*. It feeds on many shrubs and trees, *Rosa*, *Rubus*, *Prunus*, &c. When the larva is young it attaches leaf fragments to the mouth of the case, which then presents a frilled appearance.

C. albitarsella, *Zell.*

This species does not appear common in the Gardens. Mr. Nicholson and myself made search for the larva on several occasions before we succeeded in finding it. One of its favourite haunts is on the underside of the leaves of *Nepeta Glechoma*, where that plant grows among nettles at the foot of a hedge. It occurs in P.

C. ibipennella, *Zell.*

Not rare in the Gardens on birch. The larva lives in a case spun entirely of silk and shaped somewhat like a minute black pistol. It is still undetermined whether this species, known in England as *ibipennella*, is really Zeller's species of that name.

C. murinipennella, *Dup.*

This is abundant in May in Q. On the 10th of May, 1907, the grey moths were fully on the wing, especially where the food-plant, *Luzula campestris*, was conspicuous among the herbage.

Elachista apicipunctella, *Stn.*

One taken in P.

E. albifrontella, *Hüb.*

Taken among grass in Q.

E. nigrella, *Haw.*

Not rare among grass in Q. The imagines of this genus are fairly numerous in individuals, but from their retired habits are easily overlooked. The larvae are miners in the leaves of grass and sedge.

Gracilariidae.

Gracilaria alchimiella, *Sc.* (*swederella*, Thnbg.).

This pale purple and yellow insect occurs among oaks in the Gardens. Its habit of sitting with its head much raised, gives it a striking appearance when at rest.

G. stigmatella, *F.*

Only one imago has yet been captured, but the "cones" of the larvae were frequently noticed in A. and P. on poplar and willow last autumn. The larva twists a portion of the leaf into a cone-shaped domicile, and feeds in the interior. The imago hybernates, and may be met with in the spring.

Ornix betulae, *Stn.*

Not rare on the birches in A. The larva lives within a domicile made by folding over a portion of the leaf.

Lithocolletis hortella, *F.*

One taken by Mr. A. L. Simmons. This is a local species, and appears to be rare in this district.

L. alniella, *Zell.*

In the alder plantation near the lake.

L. ulmifoliella, *Hüb.*

Among the birches in May. It appears to have nothing to do with elms. The larva lives in a mine on the underside of birch leaves.

L. viminiella, *Stn.*

One specimen bred from mines on the underside of the leaves of *Salix caprea.*

L. comparella, *Zell.*

Common in the gardens at rest on the bark of poplars. The larva makes mines on the underside of the leaves of *Populus alba*, *P. nigra*, and var. *pyramidalis.*

Tischeria marginea, *Haw.*

Common among brambles in Q. The larva makes whitish cornucopia-shaped mines in leaves of bramble.

Lyonetia clerkella, *L.*

Occurs in P. It is an interesting little moth. The larva makes bold galleries in the leaves of apple, cherry, &c. When full fed it leaves the mine and spins two silken strands along a leaf, which cause it to buckle. On these strands it then forms a cocoon which hangs like a hammock between them. Here the pupa rests till the little white moth comes forth.

Phyllocnistis suffusella, *Zell.*

The mines of this species are common on the leaves of poplar in the Gardens. The larva is very peculiar in appearance and habits. It has no legs but a long forked tail, quite unlike a lepidopterous larva, and lives only on the juice of the leaf. When

full fed it casts its skin and assumes a shape much more like an ordinary caterpillar, and without further feeding it at once spins its cocoon. The leaves mined by this species appear as though a snail had crawled over them and left a slimy track. Goeze observed this as long ago as 1774. The larva in the mine may easily be observed with the aid of a lens.

Cemiostoma (Leucoptera) laburnella, *Stn.*

Taken by Mr. Nicholson in Q. The larvae make blotches in the leaves of laburnum.

Bucculatrix cristatella, *Zell.*

Common among yarrow in Q.

Opostega salaciella, *Tr.*

Occurs in Q. Its larval habits are still unknown. The white moth is peculiar in having the bases of the antennae enlarged into eyecaps, which completely cover the eyes when the moth is at rest.

Trifurcula immundella, *Zell.*

Not rare among *Cytisus scoparius.* Its habits are somewhat similar to those of the above mentioned *Cemiostoma spartifoliella,* and it shares probably with that species in the destruction of the broom.

Nepticula marginicolella, *Stn.*

Occurs in P. The larva mines usually close to the margin of the leaf of elm, sometimes so closely that the mine follows the serration of the leaf.

N. plagicolella, *Stn.*

Also occurs in P. The larva commences its mine by making a fine gallery in the leaf of blackthorn or (as in the Gardens) of the domestic plum. At the end of the gallery it makes a large pale blotch.

N. basalella, *H.-S.*

The larva of this species mines in beech leaves. It occurs in A.

N. trimaculella, *Haw.*

Common in A. The minute moth may be found on the bark of poplars, and the larva in galleries between the cuticles of the leaves.

N. subbimaculella, *Haw.*

The larva mines in oak leaves, and the moths may often be seen resting on the bark in numbers. Mr. G. Nicholson sent specimens from the oak trunks in Q., and aptly wrote that the moths were there "in orderly crowds."

Narycia monilifera, *Geoffr.* (*melanella,* Haw.).

One specimen off the bark of an oak. The larva lives in a case which it carries about with it, and feeds on lichen and other vegetable growths which occur on bark.

Eriocrania subpurpurella, *Haw.*

Mr. Nicholson took two of these beautiful pale golden insects in the Gardens last May. The larva makes large mines in oak leaves.

Micropteryx seppella, *F.*

One specimen in Q. The larvae of this genus, of which those of two species are known, are of very peculiar construction. They have ten rows of ball-like appendages along the body, and eight pairs of prolegs and a terminal sucker. They feed on wet moss (*Hypnum*). Our knowledge of these singular caterpillars is due to Dr. T. A. Chapman.

XXXIX.—CULTIVATION OF THE DATE PALM IN MESOPOTAMIA.

The following article on the cultivation of the Date Palm in Mesopotamia by His Majesty's Consul at Basra, Turkey in Asia, has been received at Kew, through the courtesy of the Secretary of State for Foreign Affairs :—

"Trees can be reared from seed, but do not bear good fruit. Offshoots are preferred. The shoots are cut from the stump of the male or female tree as required, and are transplanted. The larger they are the better, as there is less chance of their being injured in transplanting. They are very hardy, and the average weight of an offshoot is about 12 lbs. If planted near the river they get sufficient water with the rise of the tide. The date gardens are intersected by irrigation trenches leading to the creeks. These fill naturally with water as the tide rises. If the land is far from the river and unaffected by the tide, the offshoots will need hand-watering for about six months. The spot must be sunny, as plants develop very slowly in the shade. Offshoots can be planted all the year round, except during 60 days in the winter and during the dog days in August. This hot period is called Bahura, and lasts seven days. The shoots are placed about 10 to 15 feet apart. They need not be planted immediately they are cut, but can be preserved for about three weeks by placing the roots in water. When planted they are wrapped up in bulrushes (Berdi) or in palm leaves (Saf) to protect them from extreme heat and cold. The soil should be soft, low enough to be affected by the tide, and all stones removed.

"Where water is plentiful and soil good, the offshoots take root and develop rapidly, bearing fruit within four or five years from the time of planting; Khadrawee bear fruit under these conditions in three years; Hallawee and Sayer in four or five years. Where water is scarce and the ground hard, seven to eight years elapse before signs of fruit are visible. Shoots are placed in a hole dug in the earth, and are surrounded by soft soil. No manure is required. Trees are manured after the third year, and cow dung is used for the purpose. The palm tree begins to bloom towards the end of February, if the weather is mild. A fleshy

spike, enclosed in a leaf or spathe (Tilla'), sprouts round the heart of the tree in a strong cover (Girif), like a sword scabbard. The sheath (Girif) splits in March, and shows a bunch of blossom, milky white in colour. If the sheath in the female tree does not burst by the end of March, it is opened artificially. On the female palm (Nakhla), the spathe (Tilla') contains the flower ('Ilib) and the stalk (Esga), enclosed in a sheath (Girif). On the male palm (Fahl), the spathe contains the twig for fertilising (Ligah), on which is the pollen (Tahin), the whole being enclosed, as on the female tree, in a sheath.

"It is usual to open the sheath in the male tree artificially, as, when left to itself, the pollen is scattered by the wind immediately it opens. The male blossom is bigger and broader than the female. The male trunk is also bigger and stouter. Its branches and prickles are stronger. The root of the branch (Karab) where it joins the trunk (Jida') is coarser than the female. The male blossom appears about a month before the female. Both are milky white.

"The branch of the date palm is called Saf, the lower part of it Gasmul, the middle part Jerida, and the leaves Birdel or Khoos; the prickles on the lower part are called Shok. The fibre of the date palm is called Lif.

"When the scabbard splits in March and the blossom appears, the female palm is fertilised. This is done by impregnating the female blossom with a portion of the blossom of the male tree. The cultivator climbs the tree, opens the bunch of female blossom slightly and deposits in it a few sprigs of the male blossom. A special kind of male palm called Ghannami is preferred for fertilising purposes because it is stronger than any other. The male blossom is only used to fertilise, it does not turn into fruit. The process of fertilisation is called Telgih. It is said that in places where date palms grow close together, the wind scatters the pollen of the male blossom and the female is impregnated naturally. When, through neglect or oversight, the female palm is not artificially fertilised, the fruit it bears does not come to perfection; it is seedless and insipid and is called Shis. In 1821, during the plague, the trees were not fertilised artificially. The pollen was scattered by the wind but the crop was less good than when artificially handled.

"About one month after fertilisation the fruit forms and is then called Hababok; in two months it is green and is called Chimri; in three months, that is in June or July, it is hard but is red and yellow and is called Khalal; in four months, that is in August, it is partially ripe, soft and juicy and is called Rutab; it is then sold in the bazars as food but is not fit for preservation. If kept two or three days it turns sour. In the fifth month, 150 days from the date of fertilisation, that is about September, the fruit is fully formed and is called Tamr. It is then cut down carefully. The date cluster is called 'Ithig. When required for local consumption, the dates are spread on the ground and left to dry in the sun for about a month. For export they are sold damp to the date brokers and are brought to the packing sheds (Chardak) and are there handed over to the packers.

"Dates are packed by hand in cardboard boxes or cartons, placed in wooden cases, in baskets and in skins, according to quality and market requirements. In some cases the juice (Dibs) is extracted. It is collected in jars and used by the natives instead of sugar. The fruit is placed in a tank (Medbasa) made of sun-dried mud or cement. It is not artificially pressed. The juice exudes naturally. Dates can be packed in baskets after the juice has been thus extracted. Dates in a hard form, dry and yellow in colour, partially ripe (Khalal), are also preserved by boiling in water and are then exposed to the sun and air till they harden. This preparation, called Khishra, if well packed and preserved from damp, will keep for some time.

"A species of date called Zahdee is used for distilling arak or spirit. Zahdee dates make the best arak. Basra water is not suitable for the purpose and it is made at Bagdad.

"There are many varieties of dates and each kind has a special name. The principal kinds are as follows :—

Hallawee, the best kind at Basra, ripens early and is packed in boxes for export generally.

Khadrawee, packed in boxes for export to the United Kingdom, America and the Continent, also to Egypt, Tunis and Oran.

Sayer or S'Amran, packed in boxes and baskets for export.

Zahdee, packed for export in baskets and skins.

Deree, packed in baskets for export.

Chibchab, used for cooking in the semi-ripe stage and also eaten uncooked. They are hard and yellow.

Maktum, much smaller than Chibchab and used for the same purpose.

Hassawee, are eaten in the moist stage (Rutab), and are not sold for export.

Berhee, are eaten in the moist form and are kept in baskets, but are not exported.

'Aweydee, a kind much prized by the natives, are dried and kept for eating, but are not exported.

Ashgar, are eaten in the hard (Khalal) stage or moist (Rutab), but are not exported.

Asabi-el-Arus 'Bride's fingers,' are eaten moist and dry, but are not exported.

Khissab, ripen late, are left on the tree till the winter and then eaten in the Khalal or Rutab stage, but are not exported.

Lilwee, ripen late and are eaten in the moist and dry stages, but are not exported.

Firsee, a red date, ripens late and is kept for eating.

Guntar, are eaten moist or dry, but are not exported.

"The droppings throughout the season from the 'Ithig or date cluster are called Dosan and Hashaf. They are collected and given to cattle. Cows are fed largely on dates. Dosan are also eaten by the natives. The date palm is of great use to the poorer classes and is employed in a variety of ways. The peasants feed

on the droppings from May to September and keep the fruit when ripe as food for the ensuing seven months. The branches supply fuel and material for hutting and fencing. The fruit stalks are converted into brooms. Rope called Kumbar is made from the date fibre. The leaves are woven into matting and beds, chairs, cages, coops and household furniture are manufactured from the branches. The trunks are cut up and used in housebuilding and bridge making; they are also scooped out and converted into water pipes and gutters.

British Consulate,
Basra, March 31, 1908. F. E. CROW."

XL.—DIAGNOSES AFRICANAE: XXIV.

951. **Cotylonychia**, *Stapf*, gen. nov. [Sterculiaceae]; distinctissimum, ob flores hermaphroditos, petalorum structuram, androgynophorum brevissimum, Buettnerieis accedens, sed sepalorum aestivatione primo imbricata mox aperta et staminibus omnibus aequalibus fertilibus diversa.

Flores hermaphroditi. *Sepala* 5, libera, primo imbricata, mox aestivatione aperta, herbacea. *Petala* 5, hypogyna, libera, initio vero contorto-imbricata, mox aestivatione aperta, basi in unguem crassiusculum leviter concavum margine albo-tomentello cinctum contracta, supra in laminam lanceolatam inflexo-apiculatam producta. *Stamina* 10, aequalia, omnia fertilia, androgynophoro perbrevi pentagono inserta, episepala ad eius angulos sita; filamenta filiformia; antherae oblongae, apiculatae, thecis parallelis 2 connectivo tenui connexis. *Ovarium* inter stamina sessile, 5-loculare, loculis multiovulatis, ovulis biseriatis; stylus indivisus; stigma 5-crenatum. *Fructus* globosus, pericarpio crustaceo, caeterum imperfecte notum.

C. Chevalieri, *Stapf* (species unica).

Frutex; ramuli teretes, diu virentes, cortice laevi, tenuiter sulcato-striati, glaberrimi. *Folia* alterna, petiolata; lamina oblongo-obovata, basi subcuneata, apice abrupte breviter acuminata, 9–12 cm. longa, 5–5·5 cm. lata, papyracea, utrinque concoloria, viridia, glaberrima, nervis lateralibus utrinque 5–7 obliquis uti venis crebre anastomosantibus utrinque prominulis, ob cellulas mucilagine repletas obscure pellucido-punctata; petiolus 8–9 mm. longus. *Flores* corymboso-racemosi; racemus glaber, subsessilis, omnibus partibus ob cellulas mucilagine et acido tannico repletas magis minusve fusco-punctatis, rhachi sub anthesi circa 1 cm. demum ad 2 cm. longa; bracteae lineares vel subulatae, 1–3 mm. longae, deciduae; pedicelli filiformes, ad 1 cm. longi. *Sepala* lanceolata vel suboblonga, acuta, ad 5 mm. longa, glabra, fusco-punctata, costula prominula. *Petala* ad 15 mm. longa, ungue disciformi 2·5 mm. alto, lamina glabra ob epidermatis cellulas magnopere fornicatas tenuissime velutina, apiculo saepe induplicato-inflexo substantia tenuiore. *Androgynophorum* vix 1 mm. altum. *Filamenta* 5–6 mm. longa. *Antherae* 1·5–1·7 mm. longae. *Stylus* 5 mm. longus. *Fructus* (immaturus) globosus, ad 3 cm. diametro, apiculo 4 mm. longo instructus.

FRENCH CONGO. Brazzaville, *A. Chevalier*, 11177, 11196.

In the absence of mature fruits and seeds I hesitate to express a definite opinion regarding the affinity of this new genus. The gynoecium is exactly that of *Leptonychia* and *Theobroma*, and the curiously-shaped petals may well be reduced to the type prevailing in *Buettnerieae*. The androecium, on the other hand, represents a more primitive condition than that observed in *Buettnerieae*, the stamens being all perfect, alike, and practically free to the base of the filaments; they resemble, however, the fertile stamens of *Leptonychia*. Another peculiarity is in the aestivation of the calyx and corolla. The sepals are distinctly imbricate in the young flower, but they soon cease to overlap, and the petals become visible between them. The petals assume the character of "open" aestivation at a still earlier stage. I had to go back to corollas less than 1 mm. long to find the petals imbricate, and even then the overlapping did not amount to much, and was confined to the upper part. The flowers appear therefore more or less open long before they have attained their full size and maturity. In the *Buettnerieae*, as we know them, the aestivation of the calyx is typically valvate and the edges of the sepals are correspondingly not attenuated. In *Cotylonychia* we find an indication of thinning-out along the edges, although the pale and submembranous margin is very narrow, and this is evidently due to the different conditions of aestivation. The aestivation of the calyx and the structure of the androecium afford, it seems at present, the only objections to referring *Cotylonychia* to the *Buettnerieae*; but it must be admitted that they are serious objections, and when more material is at hand the question will have to be considered whether the genus here described should not be taken as representing a distinct and more primitive tribe.

952. **Corchorus discolor**, *N. E. Brown* [Tiliaceae]; affinis *C. hirsuto*, Linn., foliis supra glabris et fructu ellipsoideo setis filiformibus longis densissime obtecto facile distinguitur.

Caules 30 cm. vel ultra longi, erecti, ramosi, lignosi, superne pilis stellatis tomentosi. *Foliorum* petioli 5–11 mm. longi; laminae 2–6 cm. longae, 1–2·6 cm. latae, oblongae vel oblongo-lanceolatae, obtusae vel subacutae, argute serratae, supra glabrae, subtus cinereo-albidae, pilis stellatis minutis densissime tomentosae; stipulae 5–9 mm. longae, subulato-filiformes. *Flores* capitati; capituli globosi, multiflori, pedunculati, ad nodos laterales et terminales, tomentosi. *Pedunculi* 0·5–2·5 cm. longi. *Bracteoli* 8–10 mm. longi, subulati. *Pedicelli* 2–7 mm. longi. *Sepala* 1 cm. longa, 2·5 mm. lata, lanceolata, subulato-acuminata. *Petala* 7–8 mm. longa, 4 mm. lata, obovata, apice rotundata, glabra, lutea. *Stamina* numerosa, glabra. *Ovarium* oblongum, dense piloso-tomentosum, 4-loculare, loculis 10–12-ovulatis; stylus brevis, 1·5 mm. longus; stigma leviter incrassata. *Capsula* 1·5–2 cm. longa, 1·4–1·7 cm. diam., ellipsoidea, obtusa, setis tenuissimis filiformibus flexuosis minute pilosis 5–7 mm. longis densissime obtecta.

NATAL. Near Stanger, *Wood*, 10186, and without precise locality, *Gerrard*, 1130.

953. **Corchorus Junodi**, *N. E. Brown* [Tiliaceae]; affinis *C. discolori*, N. E. Br., foliis supra minute velutino-puberulis et setis

capsulae multo brevioribus crassioribus rectis dense subtomentosis et loculis ovarii pluriovulatis differt.—*Triumfetta Junodi*, Schinz. in Mem. Herb. Boiss. X., p. 49.

SOUTH AFRICA. Delagoa Bay, *Forbes! Monteiro*, 40! *Junod!* Lourenço Marques (distributed as C. hirsutus, *L.*), *Schlechter*, 11516!

As this plant has several ovules in each cell of the ovary, it clearly belongs to the genus *Corchorus*, and is closely allied to the above-described *C. discolor*, from which it conspicuously differs by the characters mentioned.

954. **Corchorus Kirkii**, *N. E. Brown* [Tiliaceae]; affinis *C. hirsuto*, Linn., foliis longioribus, sepalis multo angustioribus et petalis ovatis (nec obovatis) quam sepalis multo brevioribus differt.

Frutex 2–3 pedalis. *Rami* fulvo-tomentosi, demum cinerei. *Foliorum* petioli 4–13 mm. longi; lamina 2–10 cm. longa, 1–2·8 cm. lata, lanceolata, obtusa vel subacuta, basi rotundata vel cuneato-rotundata, serrato-dentata, utrinque densissime velutino-stellato-tomentosa. *Stipulae* 2–3 mm. longae, subulatae, caducae. *Umbellae* axillares, 4–10 florae, dense velutino-tomentosae. *Pedunculi* 2–7 mm. longi. *Bracteae* 1·5–2 mm. longi, filiformes. *Pedicelli* 2–5 mm. longi. *Sepala* 6·5–7·5 mm. longa, 1·5 mm. lata, angustissime lanceolata, subulato-acuminata, concava. *Petala* 5–6 mm. longa, 3 mm. lata, ovata, obtusa, basi in unguem brevem contracta, glabra, lutea. *Stamina* indefinita, 4–4·5 mm. longa, glabra. *Ovarium* ellipsoideum, obscure multi-costatum, puberulum, stylo glabro. *Capsula* 1·3–2 cm. longa.

PORTUGUESE EAST AFRICA. Lower Zambesi at Tete, *Kirk*, between Lupata and Tete, *Kirk*, and above Lupata, *Kirk*, 285.

955. **Hemandradenia**, *Stapf*, gen. nov. [Connaraceae-Cnestideae]; affinis *Ellipantho*, Hook. f., sed staminibus epipetalis ad glandulas carnosas reductis, fructu indehiscente, pericarpio tenuiter crustaceo, semine arillo tenui induto et endospermio osseo copioso distincta.

Calyx 5-partitus, post anthesin persistens, haud vero auctus, segmentis valvatis. *Petala* lineari-oblonga. *Stamina* antherifera 5, sepalis opposita, cum totidem staminodiis glanduliformibus carnosis alternantia, filamentis tenuiter filiformibus e flore exsertis, antheris parvis thecis late oblongis parallelis. *Carpellum* 1, oblique ovoideum, tomentosum, in stylum filiformem attenuatum, stigmate lobulato; ovula 2, collateralia. Fructus indehiscens, oblongus, estipitatus, pericarpio tenuiter crustaceo intus glabro. *Semen* unicum, omnino arillo exsiccando tenui indutum; testa coriacea; endospermium copiosum, cartilagineum. *Embryo* cotyledonibus planis tenuibus quam endospermio angustioribus, radicula brevi.

H. Mannii, *Stapf*.

Arbuscula, 3 m. alta, ramis gracilibus, novellis fulvo-tomentellis demum glabratis cortice fusco vel cinerascente tectis. *Folia* simplicia, petiolo supra medium articulato 0·7–1 cm. longo suffulta, late elliptico-oblonga, abrupte longiuscule acuminata, basi obtusa, 10–17 cm. longa, 5–7 c.m. lata, tenuiter coriacea, supra nitida,

glaberrima, infra opaca, juniora adpresse fulvo-pubescentia imprimis in costa, tandem glabrata, nervis obliquis utrinque circiter 7 sub margine arcuatim connexis, venis anastomosantibus obscuris. *Flores* in glomerulos parvos axillares fulvo-tomentosos arcte congesti, sessiles. *Calyx* fulvo-tomentosus, 4–4·5 mm. longus; segmenta lanceolata, acuta, ima basi tantum connata. *Petala* ignota. *Filamenta* glabra, tenuia, 7 mm. longa; antherae vix 0·5 mm. longae. *Ovarium* cum stylo fulvo-tomentello 3·5 mm. longum; ovula subbasalia. *Fructus* fere 4 cm. longus, 1·75 cm. latus, rubro-purpureus, pube fulvo denso tenui obtectus. *Semen* ambitu oblongum, fuscum, 18 mm. longum, 7 mm. diametro. *Cotyledones* 13 mm. longae, 4 mm. latae, 3-nerves; radicula 1 mm. longa.

GABOON. River Muni, *Mann*, 1763.

956. **Hemandradenia** (?) **Chevalieri**, *Stapf* [Connaraceae-Cnestideae]; ab *H. Mannii* differt foliis angustioribus pulchre reticulatis, floribus paniculatis, calyce multo breviore et filamentis pubescentibus.

Arbuscula (?), ramis tenuissime fulvo-tomentellis tandem glabratis cortice fusco tectis. *Folia* petiolo 0·6–0·8 cm. longo sub apice articulato suffulta, oblonga, obtusiuscule subacuminata, basi obtusa, 9–12 cm. longa, 3–4·5 cm. lata, tenuiter coriacea, supra nitida, glaberrima, juniora infra tenuissime adpresse pubescentia, mox glabrata, nervis obliquis utrinque 7–8 sub margine arcuatim connexis, ob venas arcte anastomosantes prominulas utrinque reticulata. *Flores* 5–7-meri, pauci vel ultra 12 in glomerulos parvos tenuissime tomentellos congesti; glomeruli in ramulis gracilibus 3–6 cm. longis geminatis axillaribus vel paniculatim dispositis siti; pedicelli persistentes, 2 mm. longi; bracteae obscurae. *Calyx* griseo-fulvo-tomentellus, 2 mm. longus, segmentis magis minusve patentibus late ovatis vel triangularibus subacutis. *Petala* lineari-oblonga, apicibus recurvis, griseo-tomentella, 4 mm. longa, paulo ultra 1 mm. lata. *Filamenta* minute pubescentia, 5–5·5 mm. lata; antherae ad 0·8 mm. longae. *Ovarium* cum stylo pubescente ultra 4 mm. longum; ovula paulo infra medium loculi orta. *Fructus* immaturus estipitatus, oblongus, cinereo-fulvo-velutinus. *Semen* (immaturum) unicum evolutum.

UPPER GUINEA. Ivory Coast, basin of the Cavally River, on the shore between Cabou and Bériby, *A. Chevalier*, No. 19,943.

Considering only the flower, the two plants here described might be referred to *Ellipanthus*, where a similar reduction of the androecium sometimes occurs (e.g. *E. Thwaitesii*, Hook. f.); but the structure of the fruit and seed, as represented in Mann's specimens, is totally different. Unfortunately, Chevalier's plant exhibits only flowers and very young fruits; but on the whole it repeats the facies of *H. Mannii* to such an extent that I feel little hesitation in treating it for the present as congeneric with it. I have, however, to add that Mr. L. A. Boodle, who was good enough to examine the specimens anatomically, informs me that *H. Chevalieri* possesses cortical leaf traces which are equally absent in *H. Mannii* and *Ellipanthus Griffithii*, the latter a typical representative of the genus *Ellipanthus*. Another peculiarity of *H. Chevalieri* is the occasional occurence of 6- and

7-merous flowers. In the bud of one of the hexamerous flowers slight imbrication could be observed at the very base of the segments. There were two outermost and two innermost segments, and two which were overlapping on one side and overlapped on the other. This imbrication was, however, not to be compared with the distinctly imbricate aestivation of the Connareae and Jollydoreae. The latter also have indehiscent fruits like *Hemandradenia*, but endospermless seeds with large fleshy cotyledons.

957. **Calliandra xylocarpa**, *Sprague* [Leguminosae-Mimoseae]; species insignis leguminibus lignosis, in seriem *Racemosarum* circa *C. Houstoni* ponenda, a qua pinnis paucioribus, foliolis majoribus pro rata latioribus necnon leguminibus recedit.

Stirps arborescens, inermis. *Ramuli* circiter 5 mm. diametro, teretes, fusci, lenticellis parvis crebre punctati, juniores dense pubescentes. *Internodia* 1·5–4 cm. longa. *Stipulae* subulatae, 3–4 mm. longae, persistentes. *Folii rhachis* 5–15 cm. longa, sicut rhachiolae pilosa, petiolo communi paullo longiore quam internodiis pinnarum; pinnae 3–7-jugae; foliola 10–15-juga, oblonga vel anguste oblonga, 1–2 cm. longa, 4–6 mm. lata, apice rotundata vel retusa, basi inaequaliter rotundata, chartacea, utrinque crebre subtus conspicue reticulata, supra nitidula, fusca, glabra, subtus pallidiora, minute puberula. *Panicula* terminalis, 12–15 cm. longa, ramulis arcuato-ascendentibus. *Legumen* lignosum, 7–10 cm. longum, circiter 1·5 cm. latum, apice interdum subuncinatum. *Semina* oblonga, 1·7–2 cm. longa, 1 cm. lata.

Portuguese East Africa. Lupata, *Kirk*.

Calliandra has not hitherto been recorded from Africa, if we except the doubtfully indigenous *C. portoricensis*. The genus now includes over 130 described species, and their distribution is as follows:—3 in India, 4 in Madagascar, 1 in Tropical Africa, and the remainder in America. Most of the American species are found between the tropics, but a few occur in the Southern United States, and others in the warmer parts of the Argentine Republic and Chili.

958. **Aizoon Burchellii**, *N. E. Brown* [Ficoideae]; affinis *A. asbestino*, Schltr., foliis lineari-lanceolatis complicatis pilis longis argenteis adpressis vestitis differt.

Planta 7·5–12 cm. alta, e radice crassa lignosa ramosa. *Rami* erecti vel adscendentes, rigidissimi, 3–5 mm. crassi, lignosi, apice foliosi, inferne foliorum vaginis obtecti. *Folia* conferta, erecta, opposita, 1–2·8 cm. longa, 2–7 mm. lata, lineari-lanceolata vel anguste lanceolata, acuta, basi in petiolum vaginantem angustata, pilis longis argenteis adpressis et laxe subpatentibus utrinque vestita. *Flores* axillares, sessiles, conferti, secundi. *Calycis lobi* 3·5–4 mm. longi, ovati vel ovato-lanceolati, intra glabri, extra pilis adpressis vestiti. *Stamina* 10–20 (*Burchell*). *Capsula* apice truncata, papillosa, margine subhispido-pilosa, 5-locularis; loculi polyspermi; styli 5, filiformes.

South Africa. Griqualand West; Herbert Div., along the right bank of the Vaal River, between the confluence of the Riet River and Sand Drift, *Burchell*, 1753.

This species has a very distinct and rather singular appearance, the rigid branches bearing leaves at the apex only, and having two rows of old persistent contiguous capsules or their remains extending along one side of the branches from their very base to the base of the tuft of leaves. The stamens had all been destroyed by insects in the few flowers examined, but Burchell in his MS. note states that they are 10–20 in number ; he also states that the flowers have no styles, but on the only perfect capsule I have examined there were five ; possibly the flowers are subunisexual.

959. **Aizoon rarum**, *N. E. Brown* [Ficoideae] ; affinis *A. hispanico*, Linn., foliis longioribus, sepalis brevioribus obtusioribusque et indumento differt.

Herba annua, basi in ramos 5–6 decumbentes divisa. *Rami* 15–30 cm. longi, superne in ramos 2–4 cymoso-furcati, adpresse pubescentes, internodiis inferioribus 3–6 cm. longis, superioribus 0·8–2·5 cm. longis. *Folia* radicalia subrosulata, 8–10 cm. longa, 8–18 mm. lata, oblanceolata vel lineari-lanceolata ; folia caulina inferiora opposita, superiora alterna, 1·5–4 cm. longa, lanceolata vel oblanceolata, omnia acuta vel obtusa, basi longe attenuata, papillosa, pilis adpressis tenuiter obtecta, demum glabra. *Flores* axillares vel in furcis sessiles, distantes. *Calycis lobi* 6–7 mm. longi, ovati, obtusi, extra pilis longis albis adpressis dense vestiti, intra glabri, rosei (*Burchell*). *Stamina* 50–60, quinque-fasciculata. *Ovarium* apice depresso-truncatum, 5-angulare, glabrum ; styli 5, filiformes.—*A. lanceolatum*, Burchell, Trav., vol. i., p. 181, non Murray, nomen tantum.

South Africa. Tulbagh Div. : in New Kloof, near Tulbagh, *Burchell*, 1013.

This must be an exceedingly rare plant. Burchell collected it on June 26th, 1811, but only found one specimen, and since that date no other collector appears to have collected it, although the locality is on the main road between Cape Town and Tulbagh, and most South African collectors have botanised there more than once.

960. **Stipularia efulenensis**, *Hutchinson* [Rubiaceae-Mussaendeae] ; affinis *S. gabonicae*, Hiern, sed foliis latioribus ovato-ellipticis, petiolis crassioribus brevioribus et calycis lobis longe ciliatis differt.

Frutex scandens (teste *Bates*), ramis adultis striatis tenuiter pubescentibus, junioribus dense tomentosis. *Folia* ovato-elliptica, acute acuminata, 6–13 cm. longa, 5–8 cm. lata, utrinque parce villosa, nervis lateralibus utrinque 10–15 oblique patulis distinctis subtus longe pubescentibus, venis laxe anastomosantibus supra indistinctis subtus conspicuis ; petioli 5–13 mm. longi, tomentosi ; stipulae ovato-lanceolatae, acutae, 10 mm. longae, 5 mm. latae, intus glaberrimae, extus tenuiter tomentosae. *Capitula* 10-flora, breviter pedunculata, pedunculo 5 mm. longo tomentoso. *Involucri bracteae* 2, membranaceae, 2 cm. longae, 2·5 cm. latae, alte bilobatae, intus glabrae, extus tenuiter pubescentes. *Flores* sessiles, albi. *Receptaculum* 3 mm. longum, minute pubescens. *Calycis tubus* inaequaliter 5-lobatus, 7 mm. longus, utrinque appresse pubescens, lobis lanceolatis acutis 5–8 mm. longis 1–2 mm. latis 3–4-nerviis

longe ciliatis. *Corollae tubus* 2 cm. longus, 1·5 mm. diametro, extus inferne glaber, superne longe appresse pilosus, intus tenuiter pubescens, lobis ovatis acutis 3 mm. longis. *Antherae* 4 mm. longae, 1·2 cm. infra faucem insertae, filamentis 3 mm. longis. *Ovarium* 5-loculare, stylo incluso glabro alte trilobato, lobis oblongis 3–4 mm. longis obtusis. *Fructus* ignotus.

West Tropical Africa. Cameroons, in forest at Efulen, *Bates*, 439.

961. **Randia angolensis**, *Hutchinson* [Rubiaceae-Gardenieae]; affinis *R. maculatae*, DC., a qua foliis subtus tomentosis, calycis lobis longioribus et corollae tubo breviore tomentoso recedit.

Frutex parvus (teste Wellman). *Rami* inermes, apices versus tetragoni, dense tomentosi. *Folia* anguste oblonga vel oblanceolata, 5-10 cm. longa, 1·5–3 cm. lata, apice rotundata, utrinque subtus magis pubescentia, nervis lateralibus patulis utrinque 14–16 supra impressis subtus elevatis; petioli 3–7 mm. longi; stipulae oblongo-ovatae, 6–9 mm. longae, 3–4 mm. latae, obtusae vel breviter acuminatae, utrinque tomentosae. *Flores* in axillis solitarii; pedunculi 1–1·5 cm. longi, dense tomentosi. *Receptaculum* oblongo-obconicum, 4 mm. longum, tomentosum. *Calyx* usque ad basin partitus; segmenta oblonga, 1–1·2 cm. longa, 2–3 mm. lata, 1-nervia, utrinque tenuiter pubescentia, basi glanduligera, glandulis elongato-oblongis 12–14 pro segmento. *Corolla* hypocraterimorpha; tubus 5–6 cm. longus, 1·5 mm. diametro, extus tomentosus, intus superne pubescens; lobi ovato-lanceolati, acuti, 2–3 cm. longi, 0·8–1 cm. lati, subtus sparse sericei, supra glabri. *Antherae* 1·3 cm. longae, supra medium affixae, 8 mm. infra sinus insertae. *Ovarium* 2-loculare, circiter 3 mm. diametro; stylus gracilis, 1·5 cm. longus, glaber. *Fructus* globosus, 1 cm. diametro, tomentosus. *Semina* irregulariter pluriangulata, nitida.

Angola. At a point Lon. E. 15° 05′; Lat. S. 12° 44′; alt. 1360 m., *Wellman*, 1826. Flowering in the wet season.

962. **Chironia (Roeslinia) baccifera**, *Linn.* var. **Burchellii**, *Prain* [Gentianaceae-Chironieae]; a *C. baccifera*, Linn., typica, differt foliis patentibus anguste-oblongis apice obtusis vel subacutis recurvatis 8–12 mm. longis 3 mm. latis, lobisque calycinis rotundatis. *C. baccifera*, Griseb. in Gen. et Sp. Gent. 105 et in DC. Prodr. ix. 41; E. Mey. Comm. Pl. Afr. Austr. 180; Gilg ex Zahlbr. in Ann. Naturhist. Hofmus., Wien, xv. 65, partim; vix Linn. *C. baccifera*, var. *dilatata*, Schoch in Bot. Centralbl. Beih. xiv. 189 partim; vix E. Mey.

S. Africa. Cape Colony; Clan William Div.; Alexander's Kloof, *Wallich*. Tulbagh Div.; New Kloof, *Drège*. Paarl Div.; Paarl Mountain, *Drège*, 1895. Cape Div.; near Cape Town, *Thunberg*; *Banks*; *Wallich*; *Krauss*; *Ecklon*; *Rehmann*, 1895. Simons Bay, *MacGillivray*, 620. Simon's Town, *Wolley Dod*, 680. Worcester Div.; Bains Kloof, *Wawra*, 56. Riversdale Div.; Gouritz River, *Penther*, 2013; and without precise locality, *Rust*, 261. George Div.; Montagu, 1000 ft., *Marloth*, 2799. Uitenhage Div.; *Zeyher*. Bathurst Div.; Mouth of the Great

Fish River, *Burchell*, 3739; Port Alfred, *Haagner*, 74. Albany Div.; Assegai Bosch, *Baur*, 1028; Fish River Heights, *Hutton*.

This variety, which has been treated by Schoch as part of the var. *dilatata* distinguished by E. Meyer (Comm. Pl. Afr. Austr. 180), certainly serves to connect Meyer's variety, which has subspathulata oblong-obtuse leaves, 2–2·5 cm. long, and 4–6 mm. wide, with typical *C. baccifera*, but it seems preferable to follow Burchell in recognising it as a distinct variety, which he did in a field note dated 22 September, 1813. As Burchell remarks in that note, this variety has altogether the habit of typical *C. baccifera* which is hardly the case as regards var. *dilatata*.

The large-flowered form of *C. baccifera*, confined to a restricted area in the Uitenhage and Port Elizabeth Divisions, distinguished by Grisebach as var. *grandiflora*, which has been relegated by more recent writers to typical *C. baccifera*, is quite entitled to the status accorded to it by its author. On the other hand, the form recognised by E. Meyer as var. *elongata*, with unusually long pedicels, which is based on a specimen that has the distinction of being the only authentic record of the existence of *C. baccifera* beyond the Coast Region of Cape Colony, is not really varietally separable from *C. baccifera* proper.

963. **Chironia (Linochiron) gracilis**, *Salisb.* [Gentianaceae-Chironieae]; species *C. emarginatae*, Jarosz, quam maxime affinis; differt tamen calyce altius lobato, lobis lanceolatis vel anguste oblongis, nec late triangulis basi subauriculatis.

Suffrutex erecta, glabra. *Caulis* 10–20 cm. altus, obscure 4-gonus, ramosus, ramis gracilibus virgatis. *Folia* numerosa, anguste linearia vel subulata, opposita, decussata, 1·5–3 cm. longa, 1–1·5 mm. lata. *Flores* 1–3 terminales, pedunculis gracilibus 1·25–2·5 cm. longis. *Calyx* alte 5-fidus, 0·75–1 cm. longus, lobis lanceolatis vel anguste oblongis saepius tandem subpatentibus tubo parum longioribus. *Corolla* 5-loba, tubo anguste campanulato calyce breviore, lobis oblongis vel ovatis obtusis vel subacutis 8–12 mm. longis 6–7 mm. latis. *Stamina* in parte superiore tubi corollae inserta; antherae rectae vel minopere curvatae. *Ovarium* ovoideum, obtusum, 6 mm. longum. *Capsula* oblonga, obtusa, 8 mm. longa. *C. linoides*, Thunb. Prodr. Pl. Cap. 35, et in Trans. Linn. Soc. vii. 252, et Flor. Cap. ii. 108; Willd. Sp. Pl. i. 2, 1070; Burch. Trav. i. 19; Griseb. in Gen. et Sp. Gent. 105 et in DC. Prodr. ix. 41, syn. *C. uniflora*, Eckl., non Lamk. excl.; Eckl. Un. It. n. 40; Schoch in Bot. Centralbl. Beih. xiv. 203, t. 16, fig. 4; nec Linn. *C. linoides* var. *subulata*, E. Mey. Comm. Pl. Afr. Austr. 180; Schoch in Bot. Centralbl. Beitr. xiv. 203, syn. var. *Zeyheri*, Griseb., excl. *C. lychnoides*, Cham. et Schlecht. in Linnaea i. 190, syn. *C. emarginata*, Jarosz, excl.; nec Berg. *C. vulgaris*, var. *intermedia*, Cham. in Linnaea vi. 343.

S. Africa. Without locality, *Sparrmann; Osbeck; Burmann; Zeyher*, 237; *Krauss*, 458; *Lehmann; Thom; Reynaud; Belanger*. Cape Colony: Van Rhynsdorp Div.; Windhoek, *Niven*. Tulbagh Div.; New Kloof, *Zeyher;* Tulbagh Kloof, *Ecklon;* Elands Kloof, 1000–1500 ft., *Drège*, 1894. Worcester Div.; near Dutoits Kloof, 1500–2000 ft., *Drège;* near Vogel Valley, *Ecklon;* mountains near Worcester, *Rehmann*, 2491.

Cape Div.; Cape Flats, *Banks & Solander*; *Roxburgh*; *Halfer*; *Wallich*; *Bunbury*; *Burchell*, 76; *Zeyher*, 1197 partly; *C. H. Bergius*; *Ecklon*, 642; Table Mountain, *Ecklon*, 40; Devil's Mountain, *Bunbury*. Caledon Div.; hills near Grabouw, 1000 ft., *Bolus*, 4180, *Kensit* (Herb. Bolus 10482); Zwarte Berg, *Zeyher*, 3424; between Brand Vley and Villiersdorp, *Bolus*, 12977; near Caledon, *Pappe*; Steenbrass River, 1150 ft., *Marloth*, 2848. Swellendam Div.; *Thunberg*, *Ludwig*. Riversdale Div.; near Garcia's Pass, *Burchell*, 7147.

Var. **macrocalyx**, *Prain*; varietas a forma typica recedens foliis parum latioribus 2 mm. latis, floribusque majoribus, calyce 1·25 cm. longo, lobis late triangulis, corollae lobis 1·75 cm. longis 0·75–1 cm. latis oblongis obtusis vel retusis. *C. lychnoides*, Thunb. Prodr. Pl. Cap. 35, et in Trans. Linn. Soc. vii. 252, et Flor. Cap. ii. 108, partim; nec Berg.

S. Africa. Cape Colony: Cape Div.; Cape Flats, *Sonnerat*; *Wallich*; *Hooker*, 637; *Ecklon*, 644; *Lalande*; Constantia, *Mrs. Jameson*; Simons Bay, *MacGillivray*, 619; *Milne*, 214; *Harvey*; *Wright*. Swellendam Div.; hills near Hottentots Holland, *Thunberg*; *Krauss*. Knysna Div.; salt marshes and moist places, *Bowie*, 5; Plettenbergs Bay, *Bowie*.

This species has been so generally confounded with *C. emarginata*, Jarosz, and the two have been so often treated as forms of *C. linoides*, Linn., that a somewhat perplexing synonymy has resulted. Whether *C. gracilis* as a whole be really specifically distinct from *C. emarginata*, which differs in having shorter, broader calyx-lobes that are subauriculate and overlap at the base, is a matter that must be left for decision by field botanists in South Africa. Chamisso, Meyer and Grisebach in herbaria, Zeyher and Ecklon in the field, have treated the three forms as at least distinct varieties, while Schoch has recently definitely demonstrated that the true *C. linoides*, Linn., is entitled to specific rank. Schoch has, however, given the name used by Linnaeus to the present species, which is not included in the citations given in the first edition of the *Species Plantarum* and is not the well-known garden plant intended by Linnaeus. The typical form of the present plant does not appear to have ever been cultivated in Europe, though there exist specimens of the variety here described derived from plants grown in Hort. D. Macky in 1807. In consequence of the application of the Linnaean name to this species, Schoch has been led to propose, for the true *C. linoides*, a new name *C. Ecklonii*.

To the courtesy of Dr. Rendle, Keeper of the Botanical Department, British Museum, we are indebted for the opportunity of consulting an unpublished monograph by R. Salisbury of the species of *Chironia* indigenous to the Cape of Good Hope, illustrated by a series of careful drawings. In this monograph the treatment of the various Cape forms is clear and satisfactory and it is interesting to find that the name proposed by Salisbury for the present species can still be taken up.

The plant here treated as var. *macrocalyx* is very distinct in general appearance both from *C. gracilis* proper and from *C. emarginata*. As regards calyx, it is intermediate between the two,

but it has larger flowers and wider leaves than either; its appearance and its comparative rarity suggests that it may be a natural hybrid between *C. emarginata* and *C. gracilis* rather than an intermediate condition of a somewhat variable species in which all three forms are to be included. This also is a point that must be left for settlement by field botanists at the Cape.

It may be noted that while, in herbarium specimens, the true *C. linoides* dries pale green, both *C. gracilis* and *C. emarginata* dry brown.

It has to be added that there is in the Delessert Herbarium a specimen of *C. gracilis* collected by Verreaux and said to be from Uitenhage; also that in the Vienna Herbarium there is another, collected by Poeppig, said to be from Port Natal. These two localities must, however, for the moment be considered as requiring verification.

964. **Chironia (Linochiron) Zeyheri**, *Prain* [Gentianaceae-Chironieae]; species *C. linoidi*, Linn., proxima; differt foliis elliptico- vel lanceolato-spathulatis, calycis lobis obtusis, corollaeque tubo calyce manifeste breviore.

Suffrutex erecta, glabra, glauca. *Caulis* 30–45 cm. altus, obscure 4-gonus, versus apicem ramosus, ramis ascendentibus. *Folia* numerosa, anguste elliptico-spathulata, opposita, decussata, apice obtusa vel subacuta, basi angustata, 3·5–5 cm. longa, 6 mm. lata. *Flores* 1–3, terminales, pedunculis 0·75–1·15 cm. longis. *Calyx* 5-fidus, 6 mm. longus, lobis ovatis obtusis mucronulatis. *Corolla* 5-loba, tubo anguste campanulato calyce breviore, lobis ellipticis obtusis 1 cm. longis 6 mm. latis. *Stamina* in parte superiore tubi corollae inserta; filamenta basi dilatata; antherae rectae. *Ovarium* ovoideum, obtusum, 6 mm. longum.

South Africa. Cape Colony; Clanwilliam Div., Companies Drift, Berg Valley River, *Zeyher*, 1198.

Var. **angustifolia**, *Prain*; varietas a forma typica recedens foliis anguste lanceolato-spathulatis 3 mm. latis, calycisque lobis ovato-lanceolatis obtusis. *C. linoides*, E. Mey., Comm. Pl. Afr. Austr. 179 quoad specimina Dregeana apud Wupperthal lecta tantum, nec Linn.

South Africa. Cape Colony; Clanwilliam Div.; Wupperthal, 1,800 ft., *Drège*; by the Olifants River and near Brakfontein, *Ecklon*; near Clanwilliam Village, *Leipoldt*, 360.

The typical form of this very distinct species has much the facies of *Orphium frutescens*, with which in some collections it has been placed. The narrow-leaved form has, on the other hand, been issued by E. Meyer along with *C. linoides*, to which species it is most closely related, though it differs as regards the length of the corolla tube, and still more markedly as regards calyx. This species is unlike most of the other species of the genus in drying black.

965. **Chironia (Heterochiron) Bansei**, *Prain* [Gentianaceae-Chironieae]; species distincta, habitu *C. linoidi* accedens; differt tamen corollae tubo cylindrico, calyce altius fisso, pedunculis calycisque lobis parce puberulis.

Suffrutex erectus, pedunculis calycisque lobis parce puberulis exceptis glaber. *Caulis* saltem 30 cm. altus, obscure 4-gonus, versus apicem ramosus, ramis plerumque alternis ascendentibus. *Folia* numerosa, lanceolata, acuta, 3–4·5 cm. longa, 5–6 mm. lata. *Flores* singuli vel 2–5, pedunculis versus apices ramorum alternis 2–3 cm. longis sub calycem parce puberulis. *Calyx* 5-partitus, 1·25 cm. longus, lobis oblongis subacutis vel acutis extra basi parce puberulis. *Corolla* 5-loba, tubo cylindrico calyci aequilongo, lobis ellipticis obtusis 2 cm. longis, 1·25 cm. latis. *Stamina* versus apicem corollae tubo affixa; antherae parum contortae. *Ovarium* ovoideum, subacutum, 8 mm. longum.

South Africa. Without locality: *Cult. specimen in Herb. Berlin.*

The specimen from which the accompanying description has been made was collected in the Kgl. Bot. Garden, Berlin, by Banse, and is marked "C. peduncularis, *Lindl.*: C. Barclayana, *Hort.*" The plant from which it was taken was believed to be from the Cape, but there are no African specimens of this form in any collection we have examined.

C. Bansei bears little resemblance to the true *C. Barclayana*, which is, as Grisebach has noted, the same as *C. peduncularis*, Lindl. It most resembles *C. linoides*, but is larger in all its parts; the calyx, moreover, is more deeply divided, and its lobes do not have the white margins or the keels characteristic of *C. linoides*; they are besides faintly puberulous outside near the base. The corolla, too, is very unlike that of *C. linoides*, or of any other member of the section *Linochiron*, and most resembles that of *Orphium frutescens*, E. Mey., a species which *C. Bansei* further recalls in having slightly puberulous peduncles and calyx-lobes. This combination of characters, and the fact that, so far as is known, this plant has only been met with in cultivation, suggests the possibility of hybrid origin. As the inclusion of this form in any of the hitherto characterised sections of the genus would involve a violation of their natural characters, it is preferable to treat it as the representative of a distinct section intermediate between *Linochiron* and *Pseudosabbatia*.

We are indebted to Professor A. Engler for an opportunity of examining this plant.

966. **Chironia (Pseudosabbatia) flexuosa**, *Bak.* [Gentianaceae-Chironieae]; species gracilis *C. transvaalensi*, Gilg., proxima, foliis caulinis tamen angustioribus, floribusque multo minoribus differt.

Herba erecta, glabra. *Caulis* 45 cm. altus, teres, simplex vel parce ramosus, ramis fastigiatis. *Folia* radicalia subrosulata, cito evanida, oblongo-ovata, obtusa, 2 cm. longa, 1 cm. lata, caulina opposita, decussata, paria circa 8, inter se 3–7 cm. remota, lineari-lanceolata, 2·5–3 cm. longa, 3–4 mm. lata. *Cymae* 1–3-florae, in paniculam terminalem dispositae, pedunculis gracilibus suberectis 1–1·5 cm. longis. *Calyx* 5-fidus, 6 mm. longus, lobis triangulis acutis extra carinatis tubo aequilongis. *Corolla* 1 cm. longa, tubo anguste campanulato calyci aequilongo, lobis anguste ovatis obtusis vel subacutis 6 mm. longis 2·5 mm. latis. *Stamina* 1 mm.

sub loborum sinibus inserta ; filamenta antheris parum breviora ; antherae parum contortae. *Ovarium* oblongum, apice acutum, 8 mm. longum ; stylus 3 mm. longus ; stigma 2-lobum.

NORTH-EAST RHODESIA. Kambole, south-west of Lake Tanganyika, at about 5,000 ft., *Nutt !*

967. **Chironia (Hippochiron) Peglerae,** *Prain* [Gentianaceae-Chironieae] ; species *C. peduncularari*, Lindl., proxima ; differt tamen foliis minoribus tenuioribus, caule erecto angulari et floribus minoribus, antherisque manifeste contortis.

Herba erecta, glabra. *Caulis* 30 cm. altus, distincte 4-gonus, ramosissimus, ramis gracilibus 4-gonis ascendentibus. *Folia* numerosa, late ovata, basi rotundata, apice obtusa vel subacuta, opposita, decussata, 3–5-nervia, nervo centrali ceteris robustiore, 1·5–2 cm. longa, ·75–1 cm. lata. *Flores* terminales et in axillis summis solitarii, pedunculis gracilibus 4-gonis 3·5–5 cm. longis. *Calyx* 5-sectus, 2·25 cm. longus, lobis lineari-subulatis, tubo subnullo. *Corolla* 2·5 cm. longa, tubo anguste cylindrico calyce vix aequilongo, fauce parum contracta, lobis ovato-lanceolatis, acuminatis 8 mm. longis, 3 mm. latis. *Stamina* parum sub loborum sinibus inserta ; antherae distincte contortae. *Ovarium* anguste oblongum, acutum, 8 mm. longum. *Capsula* oblonga, acuta, 2 cm. longa, 5 mm. lata.

SOUTH AFRICA. Transkei ; in valleys in the Kentani District at 1,000 ft., *Miss A. Pegler*, 428 !

Miss Pegler notes that the flowers are pink and open only in the mornings. This very distinct species is evidently most closely related to *C. peduncularis*, Lindl., from which, however, it differs in the points noted above. The consistence of the leaves and the general facies of the plant recalls various species of the section *Plocandra*, where also the calyx-lobes are free almost to the base ; with these it further agrees in having much twisted stamens. The narrow corolla-tube, somewhat constricted just under the limb, shows, however, that the more natural position of *C. Peglerae* is in the section *Hippochiron*, though it serves as a link connecting that section with *Plocandra*, in which the corolla tube is very short, and widened under the limb.

We are indebted to Dr. Bolus for an opportunity of studying the specimen from which the description of *C. Peglerae* has been made.

968. **Chironia (Ixochiron) scabrida,** *Griseb.* var. **ligulifolia,** *Prain* [Gentianaceae-Chironieae] ; varietas a *C. scabrida*, Griseb., typica foliis oblongo-lanceolatis vel lanceolatis 3–6 mm. latis, nec ellipticis oblongisve, 6–8 mm. latis, tuboque corolla calyce vix longiore recedens. *C. jasminoides*, Cham. in Linnaea vi. 344 (quoad specimina in planitie capensi lecta tantum) ; Knobl. in Bot. Centralbl. lx. 328, quoad syn. *C. viscosa ;* nec Linn. *C. jasminoides*, var. β, Banks ex Edw. Bot. Reg. iii. sub t. 197. *C. jasminoides*, var. *lychnoides*, Griseb., Gen. & Sp. Gent. 102 (quoad specimina ab Ecklon lecta tantum) et in DC. Prodr. ix. 40. *C. viscosa*, Zeyh. ex Griseb. in DC. Prodr. ix. 40. *C. tetragona*, Schoch in Bot. Centralbl. Beitr. xiv. 196, quoad syn. *C. viscosa ;* nec Linn. f. *C. tetragona*, var. *linearis*, Griseb.

in DC. Prodr. ix. 40, quoad syn. *C. viscosa*; nec E. Mey. *C. ligulifolia*, Salisb. Mss. in Herb Brit. Mus.

South Africa. Without locality; *Sonnerat*; *Burmann*; *Buettner*; *Banks*; *Wallich*; *Nelson*; *Brown*; *Sieber*; *Thom*, 769; *Drège*. Cape Colony: Cape Div., Cape Flats, *Rehmann*, 1972; Under Tiger Berg, near Riet Valley, *Ecklon*, 176, 262; near Cape Town, *Hesse*; Blue Berg, *Zeyher*, 1200; near Durban Road, 100 ft., *MacOwan*, 96; and in *MacOwan & Bolus, Herb. Norm.*, 961. Uitenhage Div.; near Uitenhage, *Prior*.

This variety differs from typical *C. scabrida*, which is only known from a single gathering, much as *C. tetragona*, var. *linearis*, E. Mey., differs from *C. tetragona*, Linn. f., and much as *C. tabularis*, var. *confusa*, differs from *C. tabularis*, Page.

969. **Chironia (Ixochiron) tabularis**, *Page*, Prodr. 121 [Gentianaceae-Chironieae]; Steud. Nomencl. Bot. Ed. 2, i. 352. *C. jasminoides*, Edw. Bot. Reg. iii. t. 197; E. Mey. Comm. Pl. Afr. Austr. 179; Schoch in Bot. Centralbl. Beih. xiv. 194 partim; nec Linn., vix Griseb. *C. tetragona*, Schoch in Bot. Centralbl. Beih. xiv. 196 quoad syn. Edw. Bot. Reg. tantum; nec Linn. f. *C. tetragona*, var. *brevifolia*, Griseb. in DC. Prodr. ix. 40, quoad syn. Edw. Bot. Reg. tantum; nec Griseb. in Gen. et Sp. Gent. *C. tetragona*, var. *ovata*, Schoch in Bot. Centralbl. Beih. xiv. 197, partim et quoad 9614 Schlechter tantum; nec E. Mey.

Var. **confusa**, *Prain*; varietas caulibus 30–45 cm., nec 15–25 cm. tantum altis, foliis anguste ovato-lanceolatis linearibusve 2·5–3 cm. longis 2–4 mm. latis, nec ovatis ellipticisve 1·25–2 cm. longis 6–8 mm. latis, calycisque lobis angustioribus a *C. tabulari*, Page, typica recedens. *C. jasminoides*, Cham. in Linnaea vi. 344, quoad specimina e Caledon allata tantum; Griseb. in Gen. & Sp. Gent. 101 et in DC. Prodr. ix. 40 quoad descriptionem; Knobl. in Bot. Centralbl. lx. 328; Gilg. in Engl. Nat. Pflanzenf. iv. 2, 78; Schoch in Bot. Centralbl. Beih. xiv. 194, partim; nec Linn. *C. tetragona*, var. *linearis*, Schoch in Bot. Centralbl. Beih. xiv. 197 quoad 4182 Bolus tantum; nec E. Mey.

S. Africa. Without locality; *Drège*; *Hesse*; *Zeyher*; *Lehmann*; *Thom*, 808; *Ludwig*; also *cultivated specimens*. Cape Colony: Caledon Div.; mountains near Greitjes Gat, 1,600 ft., *Bolus*, 4,182; Houw Hoek, 1,800 ft., *Ecklon*; *Schlechter*, 9,393; near Genadendal, *Prior*; *Pappe*; Zwart Berg, *Pappe*; Bavians Kloof, near Genadendal, *Ecklon*; *Gibbs* (Herb. Bolus, 10,036); between Caledon and Pot River, *Ecklon*.

In addition to the cultivated specimens of the typical plant, which was at first erroneously referred in English gardens to *C. jasminoides*, and was subsequently named by Page *C. tabularis*, there are specimens in various herbaria from the following localities:— Stellenbosch Div.; Lowrys Pass, 1,000–2,000 ft., *Drège*. Bredasdorf Div.; hills near Elim, *Bolus*, 8,578; Koude River, *Schlechter*, 9,164. Swellendam Div.; in salt marshes, *Bowie*.

The true *C. jasminoides*, Linn., of which *C. lychnoides*, Berg., and *C. nudicaulis*, Linn. f., are no more than varieties, is a member of the section *Hippochiron*. There would appear to have been no

dubiety with regard to the identity of the species until the appearance of Thunberg's account of the genus (Trans. Linn. Soc. vol. vii.). The description given by Thunberg does not apply to the Linnean plant; the specimens in Thunberg's herbarium, which, through the courtesy of Professor Juel, we have had an opportunity of examining, show that the species to which Thunberg intended to apply the name is *C. melampyrifolia*, though with this he mixed a form of typical *C. tetragona* and, to a greater extent, *C. tetragona* var. *linearis*, E. Mey., giving an example of the latter to the younger Linnaeus, which is now in the Linnean Herbarium. Grisebach has in part followed Thunberg, since his *C. jasminoides typica* includes *C. melampyrifolia*, though the plant mainly intended by him is *C. tabularis*, var. *confusa*, which was first included in *C. jasminoides* by Chamisso. Edwards, or Ker-Gawler, in the Botanical Register and E. Meyer have, on the other hand, applied the name *C. jasminoides* to the plant which Page, almost simultaneously with the appearance of the description in the Botanical Register, treated as a distinct species, *C. tabularis*.

C. melampyrifolia, Lamk., has been similarly misunderstood. Thanks to the courtesy of Prof. Lecomte, we have been able to ascertain that *C. melampyrifolia* is the plant which in the first instance Lamarck tentatively referred to *C. lychnoides* (Encyc. Meth. i. 736), but which, on his discovery that it was not that species, Lamarck distinguished as a new species (Ill. Gen. i. 479). The name given by Lamarck was applied by E. Meyer, who in this has been recently followed by Schoch, to the plant that has since been described as *C. laxa*, Gilg. Lamarck's original type, however, makes it clear that *C. melampyrifolia*, Lamk., is in reality the species subsequently taken by Thunberg for *C. jasminoides*, Linn., and still later described in turn by Ecklon as *C. perfoliata*, by E. Meyer as *C. speciosa*, and by Paxton as *C. glutinosa*.

970. **Dorstenia (Eudorstenia) Smythei**, *Sprague* [Urticaceae-Moreae]; affinis *D. altae*, Engl., a qua nervis lateralibus foliorum numerosioribus et receptaculis minoribus recedit.

Frutex 2–2·4 m. altus, ramulis gracilibus circiter 1·5 mm. diametro superne puberulis inferne glabrescentibus, novellis tantum pubescentibus, internodiis 2·5–3 cm. longis. *Folia* oblanceolato-vel obovato-oblonga, apice subabrupte longiuscule acuminata, obtusa vel subacuta, basi cuneata, 11–14 cm. longa, 3·3–5 cm. lata, superne leviter subundulato-dentata, supra sparse lepidota, nervo medio et lateralibus paullulo prominulis, subtus sparse puberula nervis satis prominentibus; nervi laterales utrinque 9–10; petioli puberuli, 0·5–1 cm. longi. *Stipulae* oblique ovato-oblongae, acutae, ciliolatae, extra sparse puberulae praecipue in nervo medio. *Receptacula* in axillis superioribus solitaria, in pedunculos puberulos circiter 11 mm. longos angustata, naviculiformia, bicrura, 1–2 cm. longa, cruribus 1·6–1·7 cm. longis rectis ascendentibus linearibus ab apice in basin leviter angustatis puberulis demptis, 4 mm. lata, medio 4 mm. alta, puberula, margine integro 0·75 mm. lato. *Flos femineus* in centro receptaculi solitarius, perigonio tubulari 0·75 mm. prominente extra valde papilloso. *Ovarium* oblongum, 2·5 mm. longum, stylo ei sub-

aequilongo, stigmatibus duobus revolutis. *Flores masculi* numerosi, diandri, perigonio bipartito extra valde papilloso.

SIERRA LEONE. *Smythe*, 237.

XLI.—CULTIVATION OF SISAL HEMP IN GERMAN EAST AFRICA.

The following article on the cultivation of Sisal hemp in German East Africa, which is an abstract from Dr. Stuhlmann's paper in *Der Pflanzer*, Nos. 15 and 16, September, 1907, pp. 229–243, appeared in the *East African Standard* for May 16, 1908 :—

In 1893 the German East Africa Company in East Usambara ordered 1,000 Sisal plants from Florida, but only 62 survived the journey. These were carefully tended in the plantation at Kikogwe, and new plants were propagated from them, so that in 1898 the number had increased to 63,000. In 1899 machinery was introduced for extracting the fibre. By the beginning of January, 1900, there were no less than 150,000 plants established, of which 4,000 were more than three years old and were ready for cutting. After it had been ascertained, by means of small samples sent for valuation, that the fibre was of good quality, the first consignment was made in 1900. The following are the amounts and values of the exports of Sisal hemp from Kikogwe during the years 1900 to 1906 :—

Year.	Amount.	Value.	Year.	Amount.	Value.
	Tons.	£		*Tons.*	£
1900	7½	155	1904	624	18,300
1901	45	1,300	1905	887	27,000
1902	177	5,445	1906	986	32,000
1903	347	9,860			

In 1894, out of a total of 1,800,000 plants, as many as 1,300,000 were ripe for cutting, and from these were obtained 624 tons of fibre ; hence the yield per plant was about 17 ozs. The same number of plants were cut in 1905, and yielded 887 tons, or about 25 ozs. per plant. In 1906 there were 1,600,000 plants fit to be cut, and these produced 986 tons of fibre, or about 22 ozs. per plant. From these figures it appears probable that each plant, after reaching the age at which leaves can be cut from it, will give an annual yield of 17 to 23 ounces of fibre, and that in a carefully-cultivated plantation about two-thirds of the total number of plants will be ready for cutting if replanting is carried out where necessary. From 1,000,000 plants, of which 666,000 can be cut annually, a crop of 333 to 433 tons of fibre may be anticipated. In order, however, that this yield may be maintained, it is

necessary that half-a-million new plants should be inserted between the old ones, as cutting can only be carried on for two or three years in German East Africa before the plant puts forth its inflorescence, or "pole." It is calculated that if 800 plants are planted per acre an annual crop of 900 to 1,200 lbs. per acre should be obtained. The results obtained at Kikogwe lend support to this estimate.

The following table gives interesting particulars as to the approximate number of Agave plants in the different districts of German East Africa at the beginning of 1907, and the proportion which were ready for cutting :—

District.	No. of Plantations.	No. of Plants.	No. of Plants ready for cutting.	Total Area planted.	Area occupied by Plants ready for cutting.
				Acres.	*Acres.*
Tanga	13	10,305,600	2,168,000	14,250	3,190
Wilhemstal ...	3	810,160	—	560	—
Pangani	2	3,330,000	2,200,000	5,000	3,500
Lindi	5	1,127,000	110,000	1,330	137
Total ...	23	15,572,760	4,478,000	21,140	6,827

In the Tanga district the low proportion of the plants which were ready for cutting is explained by the fact that at the time of making the estimate many of the recent plantings had not yet reached maturity.

The four districts mentioned above require a total number of daily workers of 8,500, or, allowing for absence from illness or other cause, a staff of at least 11,300 people. The workers are paid on the average 40 hellers per day.

The machine employed for Sisal hemp extraction in the larger undertakings in German East Africa is one which is used to some extent in Yucatan, Mexico, and is known as the "Molla" machine.

It costs about £650, is capable of treating from 85,000 to 120,000 leaves in ten hours, and needs about 48 h.p. to drive it. The bundles of leaves as brought in from the plantation are placed by one or two workers on a travelling lattice, which carries them to a table in front of the machine. Four men are then required to open the bundles and lay the leaves on the conveyor, which introduces them to two raspadors arranged at right angles to one another, where they are cleaned, one-half of the leaf being stripped at a time. The fibre on leaving the machine slides down on a wooden frame, and is then subjected to washing, women being employed for this work. In order to keep the machine sufficiently employed a plantation of at least 600,000 plants is requisite, which, allowing a space of 40 in. by 100 in. (about $3\frac{1}{2}$ ft by $8\frac{1}{2}$ ft.) for each plant, will cover an area of about 310 acres. Disadvantages possessed by this machine are the difficulty of replacing damaged parts, and the lack of durability of the bronze coating with which certain portions of the machine are provided.

The following are the approximate quantities and value of the Sisal hemp exported from German East Africa since 1902 :—

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Tons.	£		*Tons.*	£
1903	422	16,000	1905	1,140	43,900
1904	765	28,300	1906	1,836	66,900

During the first half of 1907 the exports from Tanga and Pangani amounted to about 1,321 tons, of value £50,600.

XLII.—POLYADOA AND HOLALAFIA.

Otto Stapf.

Polyadoa.—In the *Journal of the Linnean Society* vol. xxx. (1894), p. 90, I described what was evidently a new species of *Apocynaceae* as "Apocynacea quoad genus dubia," from specimens collected by Mr. Scott-Elliot in Sierra Leone. In the absence of fruits I hesitated to refer it to one of the genera then known or to make a new genus of it. Subsequently, when working out the *Apocynaceae* for the *Flora of Tropical Africa*, I recognised it as congeneric with *Hunteria umbellata*, Hall. f. (*Carpodinus umbellata*, K. Schum.), and based a new genus, *Polyadoa*,* on those two species. The name (*Polyad-oa*) was intended to indicate one of the principal characters by which the new genus could be distinguished from *Hunteria* and *Pleiocarpa*, two genera with which it was evidently allied. Apart from the numerous ovules, I pointed to the terminal inflorescences, the coriaceous sepals, and intracalycular glands, as characters foreign to *Pleiocarpa*. The fruit of *Polyadoa* was still unknown, but its numerous ovules suggested to me a fruit quite different from that of the 1–4-ovulate fruits of either *Pleiocarpa* or *Hunteria*. From fruiting specimens of *Polyadoa umbellata* received last year from Mr. E. W. Foster, of Lagos, my assumption has been confirmed ; but at the same time it has become clear that *Polyadoa* should be reduced to *Picralima*, a genus proposed by Pierre in 1896. The floral characters are the same, excepting the very much larger size of the flowers of *Picralima Klaineana*—the type of the genus—whilst the fruit only differs in its dimensions and in the complete separation of the carpels from an early stage in *Polyadoa* against their partial coalescence in the flower of *Picralima Klaineana*.

The two species of *Polyadoa*, which have been described by me in the *Flora of Tropical Africa*, will therefore have to stand as species of *Picralima*, viz., *P. umbellata* and *P. Elliotii*. To these should be added another, imperfectly known, species from

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* Stapf in Thiselton-Dyer, *Flora of Tropical Africa*, vol. iv., p. 103, and in *Hooker's Icones Plantarum*, t. 2762.

Liberia.* On the other hand, the generic affinity of my *Polyadoa* (?) *Simii*† is still very doubtful; it may after all be a *Pleiocarpa*.

Picralima comprises, therefore, at present, *P. Klaineana*, *P. umbellata*, *P. Elliotii*, and a fourth, species from Liberia.† *P. Klaineana* was recorded in the *Flora of Tropical Africa* from the Cameroons, Gaboon, and the Congo Free State. Specimens referable to this species have since been received at Kew from the Gold Coast (Johnson, 917) and Uganda (Dawe, 707, and 709), and considerably extend our knowledge of its area. The large flower, and, in the young state, semi-coalescent carpels, as well as the peculiar fruit, of the type of the genus, seemed to indicate a somewhat isolated position in *Plumerieae*; but with *P. umbellata* and *P. Elliotii* thrown into it the position of *Picralima* as an ally of *Hunteria* seems to be satisfactorily established.

The fruit of *P. umbellata* consists of two globose, yellow mericarps, very slightly flattened at the base where they meet, and supported by the small persistent calyx. They measure up to 3·5 cm. in diameter. The pericarp is fleshy, 4–6 mm. thick, traversed by scattered bast fibres and full of a latex, which, in specimens preserved in spirit, oozes out as a semi-liquid, gelatinous, colourless mass when the rind is pricked. The same substance also surrounds the 10–12 seeds, which are separated from each other by more or less perfect false septa. The seeds are compressed, broad-oblong, 14–16 mm. long and up to 8 mm. broad. The testa is sub-coriaceous, whitish, and conspicuously nerved, the nerves ascending obliquely and branching in the upper part. The endosperm is fleshy, and the embryo, which is about 8 mm. long, consists of two thin, foliaceous, ovate-elliptic cotyledons and a cylindric radicle of the same length as the cotyledons.

Holalafia.—Syncarpy in *Echitideae* is almost limited to a few Indo-Malayan genera, as *Vallaris*, *Lyonsia*, *Parsonsia*, and *Beaumontia*, and was not known to occur among the African members of that tribe until the discovery of *Holalafia*. This genus was described by me in the *Kew Bulletin* for 1894, p. 123, and subsequently figured in *Hooker's Icones Plantarum*, tab. 2350, from flowering specimens. In the Indo-Malayan syncarpous genera already mentioned this character applies to all species, and the genera themselves differ from the allied apocarpous genera in numerous other respects. It is otherwise in *Holalafia*. I have already pointed out (*Hook. Ic. Pl.*, tab. 2350) that *H. multiflora* corresponds nearly with *Alafia landolphioides* in the general facies and in the form of the inflorescence, and it was merely the apparently generic value of the principal distinctive character, the syncarpy of the ovary, which induced me to separate *Holalafia multiflora* generically from *Alafia*. Since then we have received, first through the kindness of Mr. P. H. Marsden, of Liverpool, and then from Mr. Pynaert, of Eala, in the Congo Free State, sufficient material to describe both the development of the fruit up to the dissemination of the seeds and the seeds themselves.

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* Stapf in Johnston, Liberia, p. 622.
† Stapf l.c. p. 624.

The carpels, which are completely consolidated in the flower, remain so until they have attained their final size, which may be as much as 1·5 m. in length and 2 cm. in diameter. They then begin to separate from the base upwards into two follicles, without, however, becoming detached from the torus, and at the same time they dehisce along their ventral sutures. For a long time the carpels remain connected near the apex, but little force is required to cause their complete separation. Most of the seeds probably escape whilst the long, pendulous fruits are in that condition. The structure of the seeds is exactly like that of *Alafia landolphioides*. At the time of the publication of the *Apocynaceae* of the *Flora of Tropical Africa* the embryo of *Alafia landolphiensis*, and, in fact, of *Alafia* generally, was unknown. Good seeds, however, have since been received from Southern Nigeria (Unwin, No. 7). The embryo is characterised by its bright green colour and by a longitudinal fold along the middle line of each side-half of the cotyledons, the margins standing out at almost a right angle to the fold. Exactly the same structure is found in the somewhat larger seed of *Holalafia multiflora*, with the exception that the margins of the cotyledons are doubled back on the fold. I may add that the seeds of only one other species of *Alafia* are known, viz., *A. lucida*, Stapf (Uganda, Whyte, without number). Here, too, the embryo is green, but the cotyledons are flat.

Holalafia, apart from the fruit character described, is thus practically nothing but a large-flowered *Alafia*, or in other words the peculiarity relied upon for its generic distinction is not correlated with any character alien to *Alafia*, and the generic distinction itself is hardly any longer justifiable. I would, in reducing *Holalafia multiflora* to *Alafia multiflora*, not even propose to retain it in a special sub-genus or section, so intimate appears to me its connection with *A. landolphioides* in the light of my present knowledge of those plants.

To complete the description of the seeds, I would add that they attain a length of 2–3 cm. and a width of about 3–4 mm., whilst their silky brown coma measures from 9 to 15 cm. in length.

De Wildeman figured an old, flattened-out follicle in his *Mission Emile Laurent*, tab. 144, and on p. 576 of the same work adds some localities not recorded so far for this species. They are all, with the exception of Kutu (south of Lake Léopold II.), near Coquilhatville, on the Congo River, and add nothing to the area indicated in the *Flora of Tropical Africa*.

XLIII.—MISCELLANEOUS NOTES.

Mr. William Fawcett, B.Sc., F.L.S., Director of Public Gardens and Plantations, Jamaica, and Mr. John H. Hart, F.L.S., Superintendent of the Botanic and Agricultural Department, Trinidad, have retired from their respective posts. Mr. Fawcett was appointed to the post which he has just vacated in December, 1886, and Mr. Hart took up his duties in Trinidad in March, 1887.

Raphionacme utilis.—In the *Kew Bulletin*, No. 5, 1908, pp. 209–215, an account was given of the new Ecanda rubber plant from Portuguese West Africa. Mr. John T. Norman, of the City Central Laboratory, 23, Leadenhall Street, E.C., who had also received some of the tuberous roots of *Raphionacme utilis*, and some of the "mutáres" (native rubber prepared from the roots) for investigation, has kindly forwarded the following report to Kew :—

"*The chemical composition of the tuberous roots of Raphionacme utilis and of native Ecanda rubber.*

"The roots were covered with a dry, brown, parchment-like skin, and in some cases were much shrunken and decomposed. On cutting the fresher roots, a white latex of pleasant odour freely exuded, whilst on tearing apart those which had decomposed, threads of a substance resembling caoutchouc were observed.

"The 'mutáres' were grey irregular lumps, roughly finger-shaped ; they possessed an earthy and somewhat musty odour, but although obviously contaminated with soil and fibrous matter, they exhibited considerable resiliency.

"*Analysis of the Mutáres.*

"Caoutchouc	80·4
Resin, &c., by alcoholic extraction	6·4
Moisture or matters volatile at 100° C. ...	1·6
Mineral matters	4·4
Fibre and matters soluble in water	7·2
	100·0

"The caoutchouc was obtained from the residue after extraction by absolute alcohol and water ; it was dissolved in toluene, the solution filtered and the filtrate precipitated by alcohol. Since this method proved troublesome when working quantitatively, owing to the swelling of the mass and the great difficulty of removing the last trace of solvent, the estimation of the caoutchouc was eventually effected by dissolving the 'mutáres' rubber in carbon tetrachloride, and then forming the tetrabromide, which is a white powder equivalent to 0·298 of its weight of caoutchouc.

"*Analysis of the tuberous roots.*

"Caoutchouc	0·77
Resin, &c., by alcoholic extraction	1·91
Dried extracted residue	7·16
Water and water soluble substances	90·16
	100·00

"In this analysis the root was dried at 100° C., and then extracted with absolute alcohol, water, carbon tetrachloride, and the extract finally treated with acetone to precipitate the caoutchouc.

"The root, in another experiment, was pulped, and allowed to soak in water with the addition of a little ammonia; the liquor was then strained off from the pulp and heated with sodium sulphate and a trace of sulphuric acid in order to coagulate the latex: the coagulated latex or caoutchouc was recovered. The fibrous fleshy residue or pulp was separately extracted with carbon tetrachloride, filtered, and the caoutchouc precipitated from the filtrate with acetone. This treatment yielded a total percentage of caoutchouc amounting to 0·95.

"A few of the 'mutáres' were sent to a rubber factory, where they were treated as ordinary crude rubber, cleansed and worked into sheet form. Some of this cleansed rubber was vulcanised, and also mixed with surrogates, &c., with very satisfactory results, having regard to the small quantity available."

Two of the tubers sent to the Royal Botanic Gardens by the Companhia de Moçambique were handed to Mr. Boodle, who has examined them in the Jodrell laboratory, and reports on the yield of rubber as follows :—

"Two tubers of *Raphionacme* were handed to me for an experimental extraction of rubber, and yielded together 6·67 grm. of caoutchouc. When received, they had lost a certain amount of their water by slow evaporation, and, a few days before, they had been soaked for an hour or two in spirit. One tuber (*a*) was considerably shrunken and comparatively dry, while the other (*b*) was very wet inside, and consequently much the heavier, the respective weights being : (*a*) 29·69 grm. ; (*b*) 78·42 grm.

"After weighing, the tubers were cut up into small pieces, soaked for a day in strong spirit, then dried in the sun, and weighed. The rubber was extracted in carbon bisulphide, and either precipitated in spirit, or obtained by evaporating off most of the solvent and then treating with spirit. Five extractions of rubber were made in the case of one tuber, six in the other, and, judging by the yield of the last extraction, the unextracted remnant must have been very small.

"The weights of the dried tubers and of the yield of rubber are given below :—

—	Tuber (*a*).	Tuber (*b*).
Weight of tuber directly after drying ...	16·75 grm.	17·32 grm.
Weight of rubber extracted	3·76 ,,	2·91 ,,
Percentage of rubber to dry-weight* ...	22·4 per cent.	16·8 per cent.
Percentage of rubber to dry-weight for the two tubers	19·6 per cent.	

* Here "dry-weight" signifies the weight of the tuber sun-dried after soaking in spirit, *i.e.*, after the extraction of the greater part of the resin and other substances soluble in spirit.

"These figures are not strictly comparable with those given by Mr. J. T. Norman in his analysis, but it will be seen that the percentage of rubber to dry-weight in the two tubers, dealt with

in this note, is considerably higher than that obtained by Mr. Norman, being 19·6 for the two tubers (*see* above), and only 10·7 (*i.e.*, 0·77 caoutchouc to 7·16 dried extracted residue) in the tuber analysed by Mr. Norman. For this comparison the dried extracted residue is treated as though equivalent to the dried tubers (*a* and *b*). The latter, however, must have contained some substances soluble in water, and traces of moisture and resin, so that their weight reads a little too high, and the percentage of caoutchouc too low. The difference between the two percentages should therefore be somewhat greater than the figures show."

L. A. B.

Romulea as a Pest in Australia.—In the *Agricultural Gazette of New South Wales*, xii., 1902, pp. 232–236, an account has been given by Mr. R. Helms of the occurrence of "*Romulea rosea*" as a weed, said to have been introduced into Australia from South Africa more than 60 years previously. Since the publication of this paper, specimens of the plant have been sent to Kew for determination, as doubts have arisen as to its identity. It has been proclaimed under the Thistle Act as a noxious weed under the name of *Romulea cruciata*.

The following letter has been received at Kew on the subject of this plant from Mr. James Tovey, Viola, Como Parade, Mentone, Victoria :—

May 4, 1908.

"I have to thank you for your kindness in naming the *Romulea* for me. If I am not trespassing too much on your valuable time I would like a little information on the following :—

"Is *Romulea cruciata*, Ker-Gawl, considered at Kew to be a synonym of *R. rosea*, Eckl. ?

"I find that after having examined several score of flowers of this introduced Irid, that the style is always shorter than stamens, whereas the style of *R. rosea*, Eckl., is longer than the stamens. Would not the fact of the style being always shorter than the stamens and smaller flowers distinguish it from *R. rosea* and bring it under *R. cruciata* ?

"If *R. cruciata* is a good species ?

"The reason I am troubling you so much on the subject is that this Irid has spread over a large portion of this State and has become a perfect pest, and has even been proclaimed under the Thistle Act as a noxious weed, under the name *Romulea cruciata*, Ker-Gawl. And as there is great confusion here over its identification, I would be pleased if you could enlighten me further on the subject."

Romulea cruciata, Eckl., is known only from the figure of *Ixia cruciata* in Jacquin's Icones, ii. t. 290, which shows stout, petioled leaves, resembling in outline those of some species of *Babiana*, but in transverse section resembling a Maltese cross, the rays being of equal length. *Romulea cruciata*, Béguinot (Engl. Jahrb. xxxviii., 335), described as "foliis cylindrico-linearibus, valde

compressis," and its forma typica as "foliis latissimis . . . nervis debilis et parum prominentibus," is probably quite distinct from Jacquin's plant.

The two other species, which have been suggested for the Australian plant, are *R. rosea*, Eckl., and *R. Bulbocodium*, Seb. et Maur., the former being widely spread in South Africa, and the latter in the Mediterranean region. The leaf-sections of these two species and of the Australian plant are identical, and show the leaf to be twice as broad as thick, while the outline of the leaf is linear and quite unlike that of *R. cruciata*, Eckl. Hitherto *R. rosea* and *R. Bulbocodium* have been regarded as distinct species, chiefly on account of their widely-separated habitats; the only structural difference suggested being that the styles of the latter overtop the anthers to a greater degree than those of the former. In the Australian plant the styles are said to be shorter than the anthers. This cannot be regarded as a valid specific difference, for Battandier (Bull. Soc. Bot. France, xxx., 238) has shown that heterostyly exists in *R. Bulbocodium*, while Schonsboe (Gewächs. Marok. 13) in 1801 described three varieties from Marocco differing in size and colour of the flowers. *R. rosea*, Eckl., was founded upon *Ixia rosea*, Linn. Syst. ed. 12, 75, which in turn was described from *Bulbocodium pedunculis nudis unifloris* in Miller's Icones, 160, t. 240, in which the styles and stamens are similar to those of the Mediterranean plant. Ker-Gawler, in a note to Bot. Mag. t. 1225, after mentioning that a doubt has arisen whether "*Ixia Bulbocodium*" of Bot. Mag. t. 265 was drawn from South African or European material, states :—"It is, however, difficult, if not impossible, to give any sufficiently precise definition of the marks that distinguish the two species" [i.e. *rosea* and *Bulbocodium*]. It seems, then, reasonable to unite these two under the name of *R. Bulbocodium*, Seb. & Maur. Fl. Roman. 17 (1818), and to regard *R. rosea*, Eckl. Top. Verz. 19 (1827), as a synonym. *Trichonema cruciatum*, Ker-Gawl. in Bot. Mag. t. 575, is a totally different plant from *Ixia cruciata*, Jacq., and has been called *Romulea longifolia*, Baker.

At Kew the following Australian specimens exist :—Western Australia : Guildford, near Perth, *C. Andrews*, 948 ; South Australia : Belair, *Max Koch*, 905 ; Victoria : around Melbourne, *McAlpine*, and Mentone, *Tovey*. Mr. Helms also records it from around Sydney, N.S.W., where the children eat the corms and seed-capsules, which they call "yams" and "puddings" respectively. From it having first attracted attention at Guildford it has been called "Guildford Grass" ; it is also known as "Onion Weed."

Analysis has shown that the foliage is not nutritious. The very large amount of sclerenchyma in the leaves makes them very tough and indigestible, and if they were longer would prove a source of useful fibre. The leaves are not touched by horses and cattle except in times of scarcity of other food. The indigestible parts collect into balls in the animals' stomachs, and have been known to cause death. The corms, on the contrary, are highly nutritious, and have been found to contain 75·3 per cent. of starch in the dry substance—a greater percentage than in the potato.

The plant propagates itself very rapidly by means of both corms and seeds. Various methods have been suggested for eradicating this weed, but the only certain one is to dig up and destroy the corms as soon as the plant is observed, and so prevent it spreading.

C.H.W.

Presentations.—GARDENS.—A pair of Egyptian Geese, presented by Mrs. Bolas, 60, Grove Park Terrace, Chiswick.

MUSEUMS.—Three pieces of old Oak logs, in good preservation, from beneath the tower of Holy Trinity Church, Hull. A.D. 1300. Presented by Mr. Francis Fox, C.E.

Fruits of *Canarium Schweinfurthii*, seeds of *Phaseolus lunatus*, a sample of African Kino (*Pterocarpus erinaceus*) and leaves of "Otokobakar" (*Bauhinia reticulata*); an infusion of the latter, prepared by boiling, is used to coagulate the latex of the "Ire" or Silk Rubber Tree (*Funtumia elastica*). From Mr. A. E. Evans, Curator, Botanic Station, Aburi, Gold Coast.

Cotton Pods, San Bartoleme, Chiapas, Mexico. Received from Mr. J. W. Brenchley.

Three portraits of William McNab, A.L.S. Presented by Prof. Bayley Balfour, F.R.S.

Twenty-six photographs of leaves and cones of *Coniferae* grown at Bayfordbury, Herts. Presented by Mr. H. Clinton Baker.

Fig (*Ficus Carica*) with caprification fly from Smyrna. Received from Mr. G. Henderson.

Fruits of a species of *Vitex* near *V. heterophylla* from Foochow, China. The seeds are known as "Chan-ngai-long" and an infusion of the root is used to control suppuration, healing ulcers with marvellous rapidity. From Brigade Surgeon T. Burton Brown, C.I.E.

1. Marmozet Cage made of split cane, undetermined, Bahia. 2. Calf's Muzzle ("huilal") made of a rush (*Juncus procerus*, Mey.?) by the Araucanian Indians, Temuco, Chile. 3. Bowl ("rali") made of the wood of *Laurelia aromatica* by the Araucanian Indians of South Chile and used for domestic purposes. Presented by Mr. R. Morton Middleton, F.L.S.

Panama Hat from Guayaquil, Ecuador. Presented by the Assistant Director.

Samples of Gutta Gerip from *Willughbeia firma*. From Pulau Jerajah, Leper Island, near Penang. Reported upon by Messrs. Lewis and Peat, Mincing Lane, E.C. as follows:—

"The 'Biscuits' are very dark and rough, but fairly strong and in good condition, worth about 3*s*. per lb."

"The nuggets are clean and in good condition, but cut wet and very spongy, value about 1*s*. 9*d*. to 1*s*. 10*d*. per lb."

"The scrap is ordinary, black, ill-shapen lumps, also cutting spongy and wet and shewing a few pieces of bark and grit, worth about 1*s*. 6*d*. to 1*s*. 8*d*. per lb. The best form to send this rubber

in would be as 'Biscuits,' but a little more care should be taken in the preparation." Received from Mr. R. Derry, Assistant Superintendent, Botanic Gardens, Singapore.

Cocoanut Diseases.—Through the courtesy of the Secretary of State for the Colonies, a copy of a Memorandum on the "Cocoanut stem-bleeding disease" by Mr. Petch, the Government Mycologist of Ceylon, has been received at Kew. The fungus causing the disease has proved to be *Thielaviopsis ethaceticus*, Went, a well-known parasite of the sugar cane in Java, Mauritius, and the West Indies. The treatment which is being adopted to combat the disease and which appears to be successful, consists in cutting out and burning all diseased tissue; the wound is then scorched with a torch of rags dipped in oil or by some other means and finally covered with hot coal tar. On large estates, young trees are being sprayed with Bordeaux mixture to avoid infection.

From the Government of Madras a report, No. 786, 15th March, 1908, on the "Cocoanut Palm Disease in Travancore," by Dr. Butler, Imperial Mycologist, has been received.

This disease appears to be due to a species of *Botryodiplodia*, a species of which genus has caused a serious cocoanut disease in Trinidad.

The character of the disease and methods of prevention are discussed at length in the report.

In *The Agricultural News*, Vol. VII., No. 162, p. 219, this latter disease is also referred to. From the preliminary experiments of Mr. Stockdale, Mycologist to the Imperial Department of Agriculture, West Indies, with the species of *Botryodiplodia* found in Trinidad, and also in British Guiana, it seems likely that this fungus is a parasite, and that it may be able to infect the healthy roots of Cocoanut palms.

Pilocarpus racemosus.—Specimens in flower and fruit of this, the only West Indian species of *Pilocarpus*, have been received from Sir D. Morris, Commissioner, Imperial Department of Agriculture, West Indies. They were obtained from the northern part of Montserrat, by Mr. W. Robson, Curator of the Botanic Station, who reports having seen numerous plants of the species.

P. racemosus, Vahl, is a strong-smelling shrub or small tree, 6–16 feet high, with thinly coriaceous leaves which are either simple, or have three or five pinnately arranged leaflets. It is a native of Martinique, Dominica* (*Anderson*, in Herb. Kew; *De Ponthieu*, in Herb. Mus. Brit.), Guadeloupe, Montserrat, St. John, Vieques, Puerto Rico and Cuba, but is scarce or very rare in several of the recorded stations, and is poorly represented in herbaria. It was discovered and drawn by Plumier, who travelled in the West Indies during 1689–1697, and it appeared in his

* Not previously recorded.

Catalogus Plantarum Americanarum, published in 1703, as *Euonymus latifolius racemosus fructu pentagono atropurpureo*; the figure and description were published in 1757 in his posthumous Plantarum Americanarum Fasciculi, p. 119, t. 127, edited by Burmann, who called it *Prunus floribus racemosis foliis ovatis obtusis*. In 1797 Vahl, who had received specimens collected at Montserrat by Dr. John Ryan, recognised that it belonged to an undescribed genus, to which he gave the name *Pilocarpus* (Eclogae Americanae, p. 29, t. 10).

Detailed synonymy of *P. racemosus* is given by Urban in Engl. Bot. Jahrb. vol. xxi., p. 553 (1896).

T. A. S.

Botanical Magazine for June.—The plants figured are *Pandanus Houlletii*, Carr., *Rhododendron micranthum*, Turcz., *Bulbophyllum fascinator*, Rolfe, *Chirita barbata*, Sprague, and *Genista glabrescens*, Briq., all of which are in cultivation at Kew. The *Pandanus* is a native of Singapore and was first introduced into cultivation in 1865. A male plant flowered in the Jardin des Plantes, Paris, in 1868. The plant now figured is also a male, and was received from the Botanic Gardens, Singapore, in 1905. *Rhododendron micranthum* is remarkable for the small size of its white flowers, which are only a quarter of an inch long. In this country, where it has been introduced from Central China by Messrs. James Veitch & Sons, it is proving quite hardy. The plant figured was grown in the garden of Mr. J. C. Williams, Caerhays Castle, Gorran, Cornwall. The *Bulbophyllum* is a native of Annam, where it was discovered by Mr. W. Micholitz, and sent by him to Messrs. Sander & Sons. It is remarkable in having the united lateral sepals prolonged into caudate appendages which are as much as seven inches long. *Chirita barbata* is a new name for a plant which has been in cultivation since 1895 under the name of *C. hamosa*, and as such is figured in the "Revue Horticole," 1895, fig. 161, and 1896, p. 184 (coloured plate). It is shown, however, that it differs from the true *C. hamosa*, R.Br., in the leaves, in the size and shape of the calyx, and in having very woolly, not glabrous, anthers. Mr. J. Sallier, of Neuilly, Seine, France, who first brought the plant into commerce, received it from the late Prof. H. Baillon, with the information that it had been introduced by means of seed from the "mountains of India." The *Genista*, a native of Central Europe, is one of the most attractive of the dwarfer species. It has been grown at Kew since 1896 when it was obtained from Mr. L. Späth, of Berlin.

Botanical Magazine for July.—The issue for this month comprises figures and descriptions of *Begonia cathayana*, Hemsl., *Coelogyne perakensis*, Rolfe, *Didymocarpus cyanea*, Ridl., *Olearia ramulosa*, Benth., var. *communis*, Benth., and *Rhododendron Mariesii*, Hemsl. and E. H. Wilson, all of which are in cultivation at Kew. The *Begonia* is a new species from Yunnan, where seeds of it were collected by Dr. A. Henry, and sent to Mr. A. K. Bully, of Neston, Cheshire, who raised a stock of plants which subsequently passed into the hands of Messrs. F. Sander and Son, to whom Kew

is indebted for the plant figured. It is an ornamental herbaceous species resembling *B. Bowringiana*, Champ. (B.M. t. 5182), and *B. laciniata*, Roxb. (B.M. t. 5021), and conspicuous by reason of its red stems and leaf-nerves, which are densely clothed with long crimson hairs. The flowers are vermilion, or salmon-coloured, $1\frac{1}{2}$–$1\frac{3}{4}$ in. across. *Coelogyne perakensis* is a new species which has hitherto been confused with another plant under the name of *C. sulphurea*, Reichb. f., a Javanese species of which there are living representatives at Kew. A specimen of the Perak plant (*C. perakensis*) was sent to Kew in 1903 from the Royal Botanic Garden, Glasnevin. The pretty *Didymocarpus*, with dark blue flowers, about $1\frac{1}{2}$ in. long, is a native of the Malay Peninsula, and seeds were first sent to Kew in 1902 by Mr. C. Curtis, at that time Assistant Superintendent of the Botanic Gardens, Penang. The plant has since been received from Professor Costantin, of the Jardin des Plantes, Paris. The elegant *Olearia* has been in cultivation at Kew for many years, its long graceful branches, bearing small leaves and numerous small white star-like flower heads, making it a plant valuable for greenhouse decoration. It is a native of Australia. *Rhododendron Mariesii* was first described in the *Kew Bulletin* last year. It belongs to the section *Azalea*, and resembles *R. rhombicum*, Mig. The Kew plants were raised from seed collected in Ichang, Central China, by Dr. A. Henry.

'Illipe' Nuts of Sarawak.—The following note on the 'Illipe' nuts of Sarawak appeared in the *British North Borneo Herald* of May 16, 1908, and appears to be of sufficient interest to warrant its re-production.

"For many years there has been exported from this country varying quantities of a valuable seed commonly spoken of as 'Illipe' nuts. The term 'Illipe' is ordinarily understood by botanists and interested commercial men to apply to a particular genus of Indian trees (*Bassia*) whose fruits provide several highly esteemed vegetable butters. It was suspected, however, that the so-called 'Illipe' nut of Sarawak would prove to be an entirely different fruit and such indeed we now know is actually the case: the fruit in question belongs to the order of Dipterocarps and the term 'Illipe' is erroneous. At the present time there are in the Kuching bazaar large quantities of this oily fruit destined for export. To Messrs. Chin Ann Bros. I am indebted for much information concerning these fruits and their origin: in their shop I saw three kinds of seed called Engkabang chantong, Engkabang Asu, and Engkabang changai, which in Singapore—according to Mr. Ridley—are known under the generic term of Sengkawang.

"*Engkabang chantong* (a Chinese perversion of jantong?) is the Engkabang 'par excellence,' having fruits much larger than either of the others and commanding a much higher price in the fat markets. When on the trees this fruit is provided with 5 (3 large and 2 small) leathery wings, giving it the appearance of a shuttlecock: in the market the wings are absent, being valueless—they are of some use to the species in promoting the distribution

of the seed by wind. The fruit itself is, roughly speaking, oval, in length about three inches; but in the bazaar it is difficult to find a whole specimen as the pericarp has been removed and the seed broken up. If this Engkabang seed be squeezed an oil oozes out; by merely indenting a seed with the finger nail this can be at once seen. The fat has recommended itself to natives of Sarawak —there are no religious objections to its use!—as of great value in cookery, and for this purpose large quantities of solid fat are extracted by a simple process of squeezing. The surplus seed is sold to the Chinaman, and in this bazaar the market price is five dollars per picul at the present time. Encouraged by such a high price, it has been planted extensively by certain enterprising Sea Dayaks of Saribas.

"Botanically the tree is a *Shorea* (*S. gysbertiana*, I believe*): it is common in lowland jungle, being particularly abundant in the districts of the Rejang, Lundu, Sadong, and Upper Sarawak.

"*Engkabang asu*—This is a smaller fruit, being not much more than an inch long. It also has five wings, the three larger ones reaching a length of six inches. The tree is common about Kuching and is known to Sea Dayaks as Engkabang rambai or buah lijan. It is another species of the genus *Shorea*.

"*Engkabang Changai* is still smaller and the fruit has five wings only about $\frac{3}{4}$ inch long. To Sea Dayaks it is known as Enteglam or Teglam, and I believe that this is also synonymous with Engkabang Tanggoi (Sea Dayak) and Engkabang terindak (Malay). To natives the oil of Teglam is perhaps the most esteemed of all, partly because it will keep for years in good condition. Botanically it is a Dipterocarp, apparently *Isoptera borneensis*.

"In the market these two latter kinds of Engkabang appear mixed up together and they sell for $2.80 per picul. The mixture comes from the Rejang district, Lundu, Upper Sarawak and Saribas.

"It seems quite possible that there is a great future for these fat producing Dipterocarps. The fat is apparently well suited for soap making, and at present the only objection to the Engkabangs as a source of vegetable fats for the European market lies in the fact that one can never be certain when the fruit season will appear. It is true that all the trees fruit at about the same time, but the period of fruiting may be at intervals of 5, 6, 7, or even 10 years. It is quite possible, however, that by cultivation and suitable selection a good strain could be produced which would solve this difficulty.

"We may mention that this class of tree, the Dipterocarps, has other good qualities to recommend it, *viz.*, the wood is often of excellent quality (*e.g.*, Engkabang pinang, Mahang besi and Loon); in some cases an oil (minyak kruing) is obtained by a very simple process from the trunk; and to this class belong the camphor and dammar producing trees. Finally, there are several other jungle

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* [Under *S. gysbertiana* in the Herbarium, Kew, the following note occurs by Sir Hugh Low: "'Bunk Tansanang,' from this a useful oil is extracted." *See* also Low, *Sarawak*, pp. 46–47.]—ED.

fruits utilised by natives as a source of cooking fat, and amongst these is one much sought for, the *katio* or *kachiau*. The tree producing this is a true *Bassia*, and is therefore entitled to the name of 'Illipe.' The oil is a pale yellow liquid with an odour like that of bitter almonds. From specimens supplied me by Mr. J. Baring Gould, a careful examination of this oil has been made recently by Mr. C. J. Brooks, of Bidi. Unfortunately it is not at present obtainable in great quantity, and it does not appear in the Kuching market; the tree is common in the jungle of the Saribas district, where the oil is well known."

Parkia Africana, *R. Br.* [*P. biglobosa*, Benth.]. **Leguminosae.**—A tree 40 to 50 feet high, native of tropical Africa. Pods and seeds of this tree have recently been received from Mr. C. W. Smythe, Agricultural Superintendent, Sierra Leone. The tree which is known under various names, viz., African Locust Kamdah, Oule or Houlle, Nitta, Nettie, Nutta, Arbre Sacre, Doura, &c., is chiefly valued for the mealy pulp in which the seeds are embedded.

This is used by the natives as food and for the preparation of a beverage, the seeds being torrefied and used as coffee or chocolate. In the Soudan the natives roast the seeds and after bruising them allow them to ferment in water until they become putrid when they are carefully washed, pounded into powder and made into cakes which are described as excellent seasoning for all kinds of food, though they have an unpleasant smell.

The leaves and roots are employed in medicine on the Gambia, being beaten up with water and applied as a remedy for sore eyes.

The following observations and analysis of the fruit pulp are gathered from the *Comptes Rendus*, CXLVI. No. 4, Jan. 27, 1908, 187.

The flour of Nettè, Nété or Néré produced by the fruit of *Parkia biglobosa*, Benth., has been described by travellers as a food much appreciated by the natives of tropical Africa. It is, however, incorrectly named flour, as it contains no starch, but must be considered as a pulp which is formed during the ripening of the pod and in which the seeds are embedded. Other genera of the same family, *e.g.*, *Cassia* and *Tamarindus* have fruit of similar appearance but in these the pulp is compact and fleshy, whilst in *Parkia* it is dry and friable at maturity.

An analysis of the pulp gave the following composition :—

	Per cent.
Water	4·90
Ash	4·96
Phosphates	0·383 (as P^2O^5).
Total Nitrogen	0·624
Substances soluble in carbon bisulphide	1·30
" " alcohol	56·67
" " water	72·00

Full details of the analysis are given in the paper which are not reproduced here.

The importance of the examination is that it shows the truly nutritive value of this pulp which is fairly rich in fatty matters, in phosphates, and especially in sugars. Attention, however, should be drawn to a fact worthy of notice that this substance is the richest known of in saccharose, the pulp of the beet-root only contains as a maximum 18 to 20 per cent. of saccharose, the sugar-cane has a percentage on the average equal to beet-root, while in the Netté flour the figure rises to more than 25 per cent., and it may, perhaps, be much higher in the freshly collected flour. If the flour or pulp of Netté can be produced in considerable quantities in Western Africa this product could be applied to various industrial purposes.

J. M. H

Para Rubber at Tenom.—The following report on the yield of rubber from Para Rubber trees in the Government Garden at Tenom, British North Borneo, was compiled by Mr. F. E. Lease, Manager of Sapong Estate, and appeared in the issue of the *British North Borneo Herald*, for June 16, 1908.

The trees in question have been grown from seeds received at Tenom some seven or eight years ago. The seeds were received without any advice and their nature was unknown, but they were planted out in a nursery bed and in due time some were transplanted into the gardens, but a large number were left in the nursery bed where they may still be seen growing in a large clump surrounded by their own seedlings.

It was not until the rubber boon reached Borneo a few years since that they were recognized as Para rubber.

As other plantations are being formed in Borneo, reliable statistics as to the growth, progress and latex-producing qualities of Para Rubber trees under known climatic conditions should be of great value.

"The yield of one and three quarter pounds of rubber per tree in 12 months' tapping of trees between 5 and 6½ years old (at the termination of these experiments) is extremely satisfactory and so is the work of the tapping coolie who took on an average 16 cuts to remove one inch of bark: most of this tapping was done with an ordinary farrier's knife and some with a "safety" tapping knife, both simple instruments devoid of adjusting apparatus and so "fool proof."

"The trees were tapped every alternate day for one year without any rest except on such days as rain fell or the tapper was sick: they seem none the worse for this treatment and have yielded 20,849 seed as against 11,591 the previous year.

"Seed is harvested at Tenom from August to November and if the weather is favourable, again in January and February.

"In connection with the question of seed I might here mention as a matter of interest that a tree on Sapong Estate has flowered when just 20 months old.

"Wounds from the "Y" tapping seem to heal much more quickly and evenly than those from "half herring bone" (all were done by the same coolie) probably the extra irritation from the three cuts of the latter prevented the regular healing of the wounds.

"There is practically no difference in yield per tree by either method of tapping but the "half herring bone" system has required the excision of 189 square inches of cortex for each pound of dry rubber obtained whereas the "Y" system only requires the excision of 147 square inches to obtain the same amount.

"This year's experiment will be the comparison of 50 trees tapped on the "Y" system against 50 trees tapped on "┐" system.

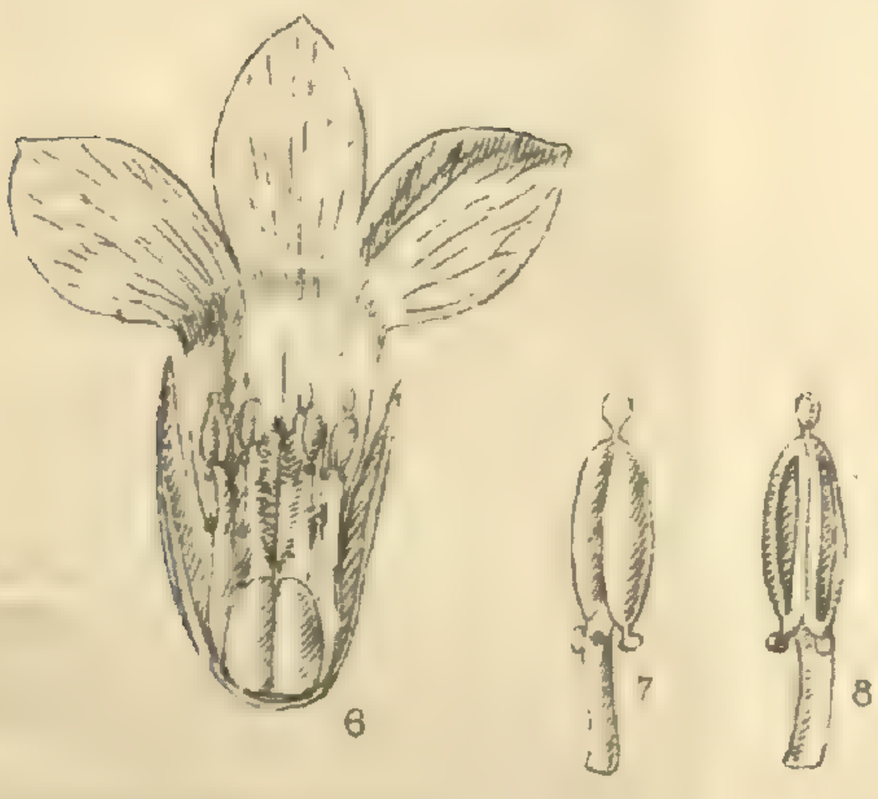
"One hundred and fifty five (155) Para rubber trees in Government experimental Gardens at Tenom were planted, not before December, 1900 nor after July, 1902 (exact date is uncertain as no records were kept). The plants have been uncared for and allowed to grow as they liked with the result that one quarter of them have two or three stems; this lowers considerably the average girth as in these calculations each separate stem is regarded as a separate tree: even then we get an average girth at five to six and a half years old of twenty-one inches at three feet from the ground, and the average increase in the girth during the last twelve months (ending 31st July, 1907) is four and three-quarter inches (Singapore Botanic Garden records an average of 3½ inches).

No. of trees tapped.	Average girth at three feet from ground.	Method of tapping.	How often tapped.	Yield of dry rubber in 12 months.	Pounds per tree per annum.	Average square inches excised.		1 lb. of rubber requires excision of square inches of cortex.	Pounds per tree per tapping.	No. of tappings in 12 months.	Total square inches excised.	Thickness of each excision.
						Per tree.	Per tree per tapping.					
30	24 in.	Y	Every alternate day for 12 months.	53¼ lbs.	1¾ lbs.	287·4	1·64	147	0·011	159	7,834	1/15 in.
30	21½ in.	Half herring bone.		53½ lbs.	1¾ lbs.	338·1	2·14	189	0·0113	158	10,141	1/15 in.

A

B

C



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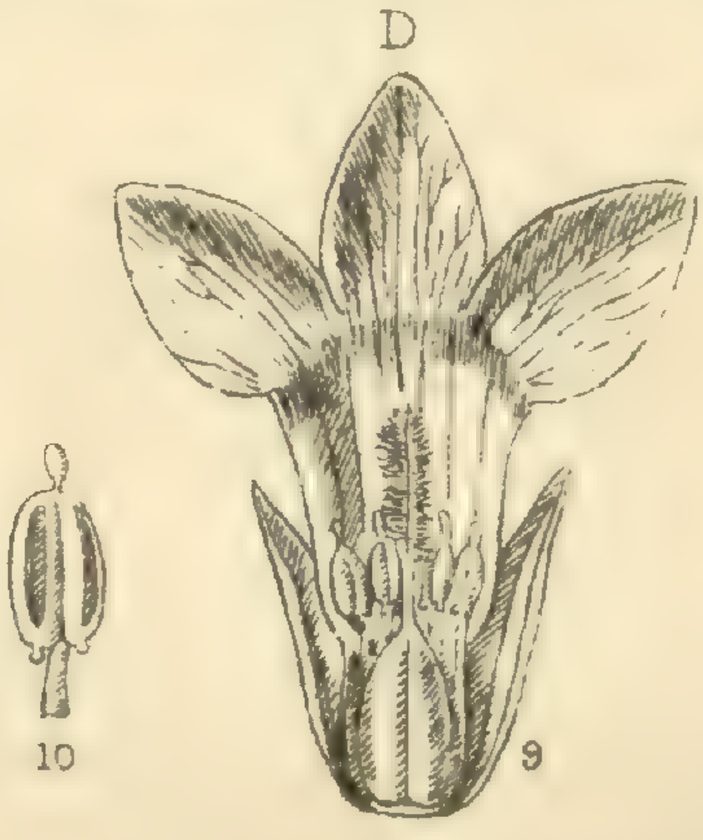

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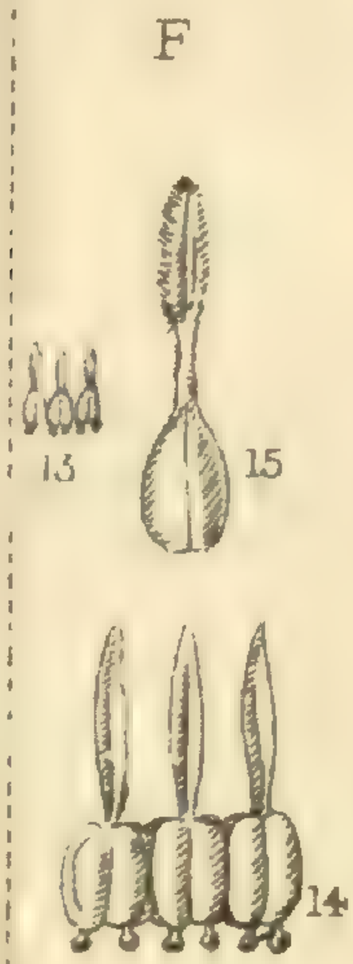

G

M.S.

EXOCHAENIUM.

[To face page 317.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8.] [1908.

XLIV.—NOTES ON SEBAEA AND EXOCHAENIUM.

SEBAEA, *Soland., ex R. Br. Prodr.* 451.

The genus *Sebaea* forms the third genus of the tribe *Exaceae* in Bentham and Hooker's arrangement of the *Gentianaceae*, and also occupies a similar position in the *Gentianoideae-Gentianeae-Exacineae* of Engler and Prantl.

E. Meyer (*Comm.*, ii. p. 186) in 1837 established the genus *Lagenias*, which was upheld by Grisebach in *DC. Prodr.*, ix. p. 54, to contain *Sebaea pusilla*, Eckl., a peculiar little species which, however, is not sufficiently distinct from *Sebaea* to be worthy of generic rank. It was merged in *Sebaea* in the *Genera Plantarum*, (ii. p. 804), and this course has been followed by Schinz in *Bull. Herb. Boiss.*, ser. II., vi., 1906, p. 731, who places it in his section *Belmontia*, although he had upheld the genus in *Viertel-jahrschr. Zürch. Naturf. Gesellsch.*, xxxvii. p. 308. Gilg, however, in *Engl. & Prantl, Pflanzenfam.*, iv., ii., p. 66, retains this monotypic genus. In the *Flora Capensis*, *Lagenias* is included under *Sebaea*.

The genus *Belmontia* was founded by E. Meyer in 1837 (*Comm.* ii. p. 183), to include certain plants formerly placed in *Sebaea*, in which the filaments of the anthers are inserted in the tube of the corolla, and not in the sinuses. This genus was maintained by Grisebach, in *DC. Prodr.*, ix. p. 54, and contained the three species *B. cordata*, E. Mey., *B. Ohlendorffii*, Griseb., and *B. spathulata*, E. Mey.; but the species *B. grandis*, E. Mey., was referred to *Exochaenium*, Griseb. (*DC. Prodr.*, ix. p. 55), in 1845.

In the *Genera Plantarum*, ii. p. 804, the genus is upheld, but includes Grisebach's *Exochaenium*, and is said to contain 5 or 6 Tropical and South African species. Gilg in *Engl. and Prantl, Pflanzenfam.* iv., ii., p. 66, retains the genus, also including *Exochaenium* and 14 or 15 species; two being from Madagascar, are considered to belong to *Belmontia*. The *Flora of Tropical Africa* follows the same course, and some 20 species are

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assigned to the genus. Schinz, in *Vierteljahrschr. Zürch. Naturf. Gesellsch.*, xxxvii., upholds the genus *Belmontia*; but in *Bull. Herb. Boiss.*, ser. II., vi., 1906, pp. 714–744, he merges *Belmontia*, E. Mey., in *Sebaea*, though he retains the species formerly included in that genus in his section '*Belmontia*.' At the same time (*ibid.*, p. 744) he keeps up *Exochaenium*, Griseb., and includes in that genus certain plants which had been placed under *Belmontia* by earlier writers. It should be mentioned that Rafinesque's name *Parasia* (*Rafin., Fl. Tellur.* iii., 1836, p. 78), is slightly earlier than *Belmontia*, E. Mey., since Meyer's *Comm.*, fasc. ii., containing the *Gentianaceae*, was published in 1837, and not in 1835, as stated by Schinz. Rafinesque's name is ignored by Gilg in *Engl. & Prantl, Pflanzenfam.*, iv., ii. p. 66, but it has been revived by S. L. Moore for his new species *Parasia Thomasii* in *Journ. Bot.*, xxxix., 1901, p. 260, and *Journ. Bot.*, xlv., 1907, p. 154. This species is now, however, included in *Sebaea*.

In the *Flora Capensis* the genus *Belmontia* is merged in *Sebaea*, and it seems hardly possible to maintain even the two sections *Eusebaea* and *Belmontia* of the latter genus, since two species, at least, occupy an intermediate position between these sections, and make it impossible to separate them by hard and fast lines.

Exochaenium was established as a genus by Grisebach in 1845, in *DC. Prodr.*, ix. p. 55, to receive Meyer's *Belmontia grandis* (E. Mey., *Comm.*, ii. p. 183); and two further species were added by Welwitsch in *Trans. Linn. Soc.*, xxvii., pp. 47, 48. As already stated, Bentham and Hooker f., Gilg in Engler and Prantl, Schinz in *Vierteljahrschr. Zürch. Naturf. Gesellsch.*, xxxvii., p. 330, *et seq.*, and Baker and Brown in *Flor. Trop. Africa*, iv., i., p. 552, *et seq.*, include *Exochaenium* under *Belmontia*; but Schinz in his last memoir in *Bull. Herb. Boiss.*, ser. II., vi., p. 744, restores the genus *Exochaenium*, in which he includes eight species. One of Welwitsch's species (*E. debile*, Welw.), is excluded and placed in *Sebaea*, and the remaining six have been taken out of *Belmontia*, E. Mey.

In the *Flora Capensis* the genus *Exochaenium* is upheld, the only South African representative being *E. grande*, Griseb. There are, however, several other species in Tropical Africa. The genus is characterised especially by the presence of a ring of disk-glands between the calyx and corolla, the stamens are inserted in the corolla-tube, and the style does not possess the biglandular swelling usually found in *Sebaea*. It is of interest to notice in passing that some of the species of *Exochaenium* have dimorphic flowers.

The genus *Sebaea* contains about 100 species, chiefly in South Africa, with a few in Tropical Africa, Madagascar, India, Australia, and New Zealand.

The representatives are annual, biennial, or perennial herbs, with erect or, more rarely, procumbent simple or branched stems with decurrent wings. In the flower the calyx-segments are keeled or more or less conspicuously winged. The anthers may be situated in the sinuses of the corolla or more or less deeply in the tube, and are usually provided with apical and sometimes also with paired basal glands. The style in most cases is furnished with a biglandular swelling (absent in the subsection *Lagenias*), which in a few species is more or less confluent with the stigma

(*e.g.*, *S. acutiloba*, *S. Zeyheri*, *S. micrantha*, and *S. intermedia*). The stigma is either exserted or included in the tube, but, except in the small group *Brevistylae*, is always situated above the anthers.

The genus can be subdivided into two well-marked sections according to whether the flowers are tetramerous or pentamerous. These sections correspond in part to the subsections *Tetrandria* and *Pentandria*, Schinz, of the section *Eusebaea*, Griseb. (*v.* Schinz in *Mitteil. Geogr. Ges. Lübeck*, xvii., 1903, p. 1 *et seq.*).

The section *Pentandria*, however, has been enlarged to include Schinz's section *Belmontia* (*v.* Schinz in *Bull. Herb. Boiss.*, ser. II., vi., p. 721), since the distinction between the sections *Eusebaea* and *Belmontia* seems somewhat of an artificial one.

In the *Flora Capensis* the enlarged section *Pentandria* has been subdivided; annuals are separated from perennials, and certain peculiar forms are kept apart as they appear to form somewhat isolated subsections. For convenience, and also to some extent in accordance with affinity, the subsections *Annuae*, *Perennes* and *Repentes* are broken up into smaller groups.

Sebaea, *Soland.*, *ex R. Br.*

Calyx segments, corolla lobes and anthers, 4.
Tetrandria, *Schinz.*

Calyx segments, corolla lobes and anthers, 5.
Pentandria, *Schinz* aug.

Calyx segments united to form a cylindrical tube for ¾ or more of their length; stamens inserted in corolla-tube.
Subsection (1). **Calycinae**, *Hill.*

Calyx segments more or less free, or if fused then for not more than half their length.

Erect annuals with 2–6, rarely more, pairs of leaves; style usually with biglandular swelling near the base, stigma above the anthers.
Subsection (2). **Annuae**, *Hill.*

Plants 1·5–15 cm., rarely 20 cm. high, simple, rarely branching from the base.

Leaves linear or ovate-lanceolate; anthers inserted in corolla-tube; style without biglandular swelling.
Group 1. **Lageniades**, *Hill.*

Leaves minute, more or less filiform; stamens in the sinuses; style usually with biglandular swelling.
Group 2. **Filiformes**, *Hill.*

Leaves ovate or cordate, usually conspicuous; stamens in sinuses or in corolla-tube; style usually with biglandular swelling.
Group 3. **Ovatae**, *Hill.*

Plants usually 10–30 cm., sometimes as much as 80 cm. high, with usually a more or less conspicuous false rosette of leaves; stems usually much branched from the base; stamens in sinuses or in corolla-tube.
Group 4. **Rosulatae**, *Hill.*

Erect perennials or biennials, with more than six pairs of leaves, branching from the base or from the leaf axils; stamens inserted either in the sinuses or tube of the corolla; style usually with biglandular swelling near the base, stigma above the anthers.

Subsection (3). **Perennes,** *Hill.*

Stems simple or branched from the base, and terminated by definite, more or less compact inflorescences.

Group 1. **Erectae,** *Hill.*

Stems with numerous axillary branches; inflorescences loose and somewhat paniculate.

Group 2. **Fastigiatae,** *Hill.*

Creeping or rosette-forming perennials with numerous spathulate or ovate leaves; flowers more or less sessile at the ends of branches, or borne on definite erect inflorescences.

Subsection (4). **Repentes,** *Hill.*

Stamens inserted either in sinuses or in corolla-tube; style with biglandular swelling, stigma above anthers.

Group 1. **Longistylae,** *Hill.*

Stamens inserted in corolla-tube; style without biglandular swelling, stigma below base of anthers.

Group 2. **Brevistylae,** *Hill.*

Sebaea (Tetrandria) ambigua, *Cham.* in Linnaea, vi., 1831, 346, et in viii., 52; Griseb. Gen. et Spec. Gent., 171, et in DC. Prodr. ix., 52; Schinz in Vierteljahrschr. Zürch. Naturf. Gesellsch. xxxvii.. 315; Gilg in Eng. Bot. Jahrb., xxvi., 88; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 17.

S. aurea, (L) R.Br., var. *congesta*, E. et Z. in herb. *S. crassulaefolia*, Zeyh. in herb. *S. albens*, Zeyh. in herb. *S. pallida*, Zeyh. non E. Mey. in herb. *S. ambigua*, Cham., var. *gracilis*, Cham. in Linnaea, vi., 346; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii, 1903, 18, in part. *S. ambigua*, Cham., var. *crassa*, Cham. in Linnaea, vi., 346; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 18.

Cape Colony. Cape Div.: Flats between Maitland Cemetery and the sea, *Wolley Dod*, 3062! in moist places among *Restiaceae* near Zeekoe Valley, *Ecklon*, 77! roadside near Simonstown by lower north battery, *Wolley Dod*, 2013! Simons Bay, pastures by the sea shore, *MacGillivray*, 593! Chapman's Bay, border of a swamp, *MacGillivray*, 593 B! North Hoek, near the shore, *Milne*, 64! Strand near Green Point, *Wilms*, 3475, partly! Cape Point, alt. 800 ft., *Schlechter*, 7308! roadside near Little Lion, alt. 700–800 ft., *Wolley Dod*, 3273! Camps Bay, *Prior*! without precise locality, *Harvey*, 613! *Burke*! *Grey*!

The variety *gracilis*, Cham., named *Erythraea exacoides*, var. *major*, Eckl. on the label, appears to be merely a weak condition of the plant. Its elongated stem, lax cymes and smaller flowers are probably due to its having grown among taller plants in damp soil. There is no structural difference to separate it as a variety. It is included by Gilg together with Schlechter, 7308, as typical of *S. ambigua*, Cham. *S. gibbosa*, Wolley Dod, which is also placed by Schinz under *S. ambigua*, var. *gracilis*, is being restored to specific rank. The variety *crassa*, Cham., is not maintained.

Sebaea (Tetrandria) gibbosa, *Wolley Dod* in Journ. Bot. xxxix., 1901, 401.

Sebaea ambigua, Cham., var. *gracilis*, Cham. in Linnaea, vi., 346; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii, 1903, 18, in part.

CAPE COLONY. Cape Div.: Muizenberg Vley, by the railway, *Wolley Dod*, 2332!

This species resembles *S. ambigua*, Cham., in the character of its leaves and calyx-segments, but differs markedly in its inflorescences and bracts, in which respects it approaches more nearly to *S. aurea*, R.Br.

Sebaea (Tetrandria) glauca, *A. W. Hill* [Gentianaceae-Exaceae]; species ex affinitate *S. ambiguae*, Cham., a qua cymis laxioribus, bracteis angustioribus et praesertim, more *S. pallidae*, E. Mey., segmentis calycis medio nec versus apicem alatis differt.

Annua, erecta. *Caulis* 10–15 cm. altus, simplex vel ramosus. *Folia* glabra, opposita, late ovata, obtusa, 8–10 mm. longa, 6–7 mm. lata, carnosa. *Flores* in cymas dense ramosas corymbiferas, cymis ultimis confertis dispositi; rami 2–3 cm. longi, pedicelli brevissimi, bracteis rhomboides-ovatis vel anguste ovatis. *Calyx* 4–5 mm. longus, segmentis erectis obovatis concavis truncatis erosis apiculatis alatis, alae ·5–·75 mm. latae, medio latissimae. *Corollae* tubus 4·5 mm. longus; lobi 4·5 mm. longi, 3 mm. lati, ovati, subapiculati. *Filamenta* ·75 mm. longa; antherae 1·5–1·75 mm. longae, apice glandula stipitata conspicua instructae. *Stylus* circiter 4 mm. longus, medio biglandulosus, stigmate bilabiato.

CAPE COLONY. Cape Div.: Cape Peninsula, roadside near Little Lion, *Wolley Dod*, 3273 A!

It seems quite possible that this plant may be a hybrid between *S. ambigua* and *S. pallida*. It is very similar to *S. ambigua* in vegetative appearance. The cymes, however, are not collected into dense capitula and the bracts are narrower and less conspicuous than in *S. ambigua*. The calyx-segments have the wings broadest at the middle like those of *S. pallida*, whereas in *S. ambigua* there is a small thick apical wing.

Sebaea (Tetrandria) aurea, *R. Br.*, Prodr., 1810, 452; Griseb. Gen. et Spec. Gent., 167, et in DC. Prodr., ix., 52; Cham. in Linnaea, vi., 346; E. Mey., Comm. 184,; Schinz in Viertel-Jahrschr. Zürch. Naturf. Ges., xxxvii., 315; Knobl. in Bot. Centralbl. lx., 324; Gilg in Engl. Bot. Jahrb., xxvi., 88; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 18. Pluk. Phytogr. Pl., t. 275, g. 3; (?) Burm. Rar. Agr., iii., t. 74, f. 4; Lam. Illustr. t. 80, f. 2.

Exacum sessile, L., Spec. Pl. ed. I., 1753, 112, in part; ed. II., 163, in part; non Griseb. Gen. et Spec. Gent., 1839, 113.

Exacum aureum, L., Suppl., 1781, 123.

Gentiana aurea, Thunb., Fl. Cap. ed. I., ii., 1818, 171.

Sebaea minima, Jaroscz, Pl. Nov. Cap., 1821, 11.

Sebaea aurea, R. Br., var. *genuina*, Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 19.

Sebaea aurea, R. Br., var. *genuina*, f. *Wurmbeana*, E. Mey., Comm., 1835, 185, (probably=var. *sulphurea*, Griseb. Gen. et Spec. Gent., 167) ; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 19.

Sebaea aurea, R. Br., var. *pallens*, Berg. in Griseb. Gen. et Spec. Gent., 1839, 167 ; Schinz in Mitteil, Geogr. Ges. Lübeck, xvii., 19.

. . . . . var. *pallens*, f. *cymosa* (Jaroscz Pl. Nov. Cap., 1821, 10) ; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 20.

. . . . . var. *pallens*, f. *gracilis*, Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 20.

Cape Colony. Clanwilliam Div. : Wupperthal, *Drège* ! Tulbagh Div. : near Tulbagh, *Pappe* ! Worcester Div. : Hex River Valley, 1700 ft., *Tyson*, 807 ! Cape Div. : Cape flats, near Rondebosch, *Burchell*, 158 ! *Harvey*, 616, Lion Mountain, *Ecklon*, 732 ! 733 ! near Cape Town, *Bolus*, 2876 ! *MacOwan & Bolus*, *Herb. Norm. Aust. Afr.* 365 ! Table Mountain, *Drège* ! slopes towards Camps Bay, *Wolley Dod*, 3330 ! Signal Hill, *Wolley Dod*, 3111 ! Sandown Road, *Wolley Dod*, 3204 ! Slangkop River, *Wolley Dod*, 3254 ! Fish Hoek Valley, *Wolley Dod*, 3438 ! Simons Bay, *MacGillivray*, 592 ! *Wright* ! Devil's Mountain, *Wilms*, 3436 ! Riversdale Div. : Heidelberg, alt. 500 ft., *Galpin*, 4335 ! near Zoetemelks River, *Burchell*, 6731 ! George Div. : near George, *Burchell*, 6008 ! 6060 ! Without precise locality, *Forster* ! *Wallich* ! *Thom* ! *Pappe* !

Sebaea aurea, *R. Br.*, var. **alata**, *A. W. Hill* ; varietas caulibus longis, internodiis elongatis segmentis calycis conspicue alatis alae ·4–·8 mm. latae, medio latissimae, distinctis.

Cape Colony. Clanwilliam Div. : Blue Berg, *Drège* ! Cape Div. : Sand flats between Tiger Berg and Blue Berg, *Drège* ! Cape Flats, *Zeyher*, 3420 ! Lion Mountain, *Drège* ! Stellenbosch Div. : Stellenbosch, *Marloth*, 3441 ! Without precise locality, *Pappe* !

S. aurea is a very variable plant in general appearance and in details of the flower ; sometimes flowers with entire and with bi-lobed stigmas are found to occur on the same individual. The forms which have here been included under *S. aurea* proper, can be easily distinguished from var. *alata* owing to the absence of a distinct wing to the calyx-segments. The variety *alata* approaches Meyer's *S. pallida*, which was included by Schinz as only another variety of *S. aurea*. *S. pallida*, E. Mey., however, is distinguished by the large wings to the calyx-segments, which are broadest at the base ; it is maintained here as a distinct species. *S. ochroleuca*, Wolley Dod, which is also closely allied to *S. pallida*, differs from that species in its smaller corolla lobes, anthers and style.

Sebaea (Tetrandria) Gilgii, *Schinz* in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 27.

Cape Colony. Cape Div. : on a flat on Muizenberg Mountain, near a stream, alt. 1300 ft., *Schlechter*, 150 !

This species is placed by Schinz in the subsection *Pentandria*, Schinz ; the flowers, however, appear to be always 4-merous, and this species must therefore be included in the subsection *Tetrandria*, Schinz. It is allied to *S. aurea*, but differs in the few-flowered inflorescences and in the calyx-segments with a wing most definite above the middle.

Sebaea (Tetrandria) pallida, *E. Mey.*, Comm., 1835, 185.

Sebaea aurea, var. *pallida*, Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 20.

CAPE COLONY. Tulbagh Div.: Tulbagh Kloof, alt. 300 ft., *Bolus*! Malmesbury Div.: near Mooresburg, *Bolus*, 9,992! Cape Div.: Fish Hoek Valley, *Wolley Dod*, 3437! Cape Flats, *Wolley Dod*, 425! Flats between Cape Town and Tyger Valley, *Drège*! Lion Mount, alt. 100-200 ft., *Drège*! *Prior*! *Bolus*, 7,212! Simon's Bay, *Wright*, 98! Swellendam Div.: mountains along the lower part of the Zondereinde River, *Zeyher*, 1187 partly!

This species can be easily distinguished from *S. aurea*, with which it has been included by Schinz, by the prominent wings of the calyx widest at the base, and by the larger and more prominent corollas.

Sebaea (Pentandria) compacta, *A. W. Hill* [Gentianaceae-Exaceae]; species distinctissima, nulli arcte affinis, foliis bracteisque lineari-lanceolatis acutis vel acuminatis calyce tubuloso insignis.

Perennis vel annuus (?), caespitosus. *Caulis* 5–10 cm. altus, ramis plurimis dense intricatis. *Folia* opposita, pauca, inferiora parva, superiora bracteaeque majores conspicua, lineari-lanceolata vel rarius ovato-lanceolata, acuta vel acuminata, 3 mm.–2 cm. longa, 1–4 mm., rarius 5 mm. lata, subcarnosa. *Flores* numerosi, in cymas numerosas ramis plurimis dispositi, bracteae lineari-lanceolatae, acutae, circiter 1·2 cm. longae. *Calyx* 1·3–1·5 cm. longus, segmentis carinatis in tubo elongato paulo inflato ·9–1·1 cm. longo connatis, partibus liberis 4 mm. longis lanceolatis acutis. *Corollae* tubus 1·0–1·2 cm. longus; lobi 6–9 mm. longi, 3–5·5 mm. lati, obovato-oblongi, apiculati vel subacuti. *Filamenta* brevissima, infra sinos corollae circiter ·5 mm. inserta; antherae 2–2·5 mm. longae, apice glandula parva basi glandulis minutis vel nullis instructae. *Stylus* 7 mm. longus versus basin biglandulosus, glandulae conspicuae 1–2 mm. longae; stigmate paullo bilabiato. *Capsula* ovoidea.

CAPE COLONY. Graaff Reinet Div.: Dutoits (Farm ?) under Compass Berg, in cultivated ground, alt. 5500–6000 ft., *Bolus*, 1853! Middelburg Div.: near Middelburg, *Denoon*, 37 (*in Herb. Guthrie*, 1043)! *Shaw*! Colesberg Div.: near Colesberg, *Shaw*! Colesberg Kopje, *Mrs. Barber*, 10!

GRIQUALAND WEST. Dutoits Pan, near Kimberley, *Mrs. Barber*, 21!

ORANGE RIVER COLONY. Between Bloemfontein and Petrusburg, *Miss Kensit* (*in Herb. Bolus*), 12992!

BECHUANALAND. By the Mashowa River, near Takun, *Burchell*, 2252/4!

This very distinct plant was first collected by W. J. Burchell in 1812, and though it has been found several times since, and is a striking and beautiful plant, it does not appear to have been described before.

The plant, as preserved at Kew and in Dr. Bolus' herbarium, has somewhat the appearance of a densely-branched specimen of *Exochaenium primulaeflorum*, Welw., or of *Lagenias*, E. Mey.

A short central axis gives off much-branched axillary shoots, which result finally in a cushion-shaped plant covered with conspicuous bright yellow flowers. In a description on the sheet in Dr. Bolus' herbarium the plant is called a stunted sub-shrub. The plant is provided with mycorrhiza and has short thick roots. In connection with the occurrence of mycorrhiza in this species and possibly also in *Exochaenium*, attention may be drawn to the cases of *Obolaria* and *Bartonia* described by Holm in *Ann. Bot.* xi., 369, and xx., 441. The first two or three pairs of leaves are very small, as in *Exochaenium*, whilst the upper two or three pairs, and the numerous bracts, which are indistinguishable from the leaves, are relatively large. According to the label on Barber's specimen, No. 21, this species is found "studding the flats in places where water occasionally lodges."

As regards the position of the anthers, this plant belongs to the *Belmontia* section of the genus *Sebaea*, and the stigma, with its large biglandular swelling, is also like that found in the genus. The long tubular and slightly inflated calyx, and the elongate linear-lanceolate leaves separate this plant from all others, and perhaps constitute characters of generic value. Should it be found after further field work that it is desirable to raise this plant to generic rank it would also become necessary to restore the genus *Lagenias*, whose relationships to *Sebaea* are of a character very similar to those between this genus and *S. Compacta*.

Sebaea (Pentandria) mirabilis, *Gilg* in Engl. Bot. Jahrb., xxvi., 1898, 92; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 35.

Sebaea pratensis, Gilg in Engl. Bot. Jahrb., xxx., 377, 378, figs. A—F; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 38; Baker and Brown in Flor. Trop. Africa, iv., 1, 550.

Cape Colony. Transkei: swampy places near Tsomo, *Mrs. Barber*, 845! hillside near Kentani, 1000 ft., *Miss Pegler* 1187! Tembuland: Bazeia Mountain, 4000 ft., *Baur*, 621! Griqualand East: Maclear Distr., grassy slopes on the farm "Woodlands," alt. 5600 ft., *Galpin*, 6772!

Natal. Mid Illovo, amongst grass, alt. 1000–2000 ft., *Wood*, 1884 (*in Herb. Kew*)!

Orange River Colony. Without precise locality, *Cooper*, 2756!

Transvaal. Lydenburg Distr., Dolomite of Spitz-Kop, *Wilms*, 971!

Tropical Africa. Nyasaland: Nkinga, alt. 2500 m., *Götze*, 916!

S. mirabilis, with which *S. pratensis*, Gilg, has been united, shows close relationship to *S. exigua*, *S. filiformis*, and *S. Welwitschii*. In all these plants the wings of the stem are minutely glandular, especially near its base. The stems are usually slender, with long internodes; the leaves are very small, and the plants are probably furnished with mycorrhiza or may be partial parasites. *S. Junodii* is doubtless closely allied to these species, and they form a small sub-group easily distinguished by their vegetative characters. *S. mirabilis* differs from the other

species in the possession of a conspicuous wing to the calyx-segments, and is usually a stronger plant. In *S. exigua*, and in *S. filiformis* to a less extent, the calyx-segments are partially fused to form a campanulate cup.

Sebaea (Pentandria) pygmaea, *Schinz* in Bull. Herb. Boiss. ser. II., vi., 1906, 740.

It seems very probable that further investigation in the field will show that this species is only a small, stunted or alpine form of *S. erosa*, Schinz. The chief points of difference consist in the smaller anthers and style, and in the absence of erose toothing to the corolla lobes in *S. pygmaea*. In this connection it is to be noticed that *S. pygmaea* has been collected from a considerably greater altitude than *S. erosa*.

Sebaea (Pentandria) conspicua, *A. W. Hill* [Gentianaceae-Exaceae]; species distincta ex affinitate *S. rotundifolia*, A. W. Hill, a qua foliis spathulatis segmentis calycis carinatis antheris uniglandulosis stigmate capitato differt.

Annua (?), erecta vel paullo repanda. *Caulis* 7–10 cm. altus, simplex vel ramosus. *Folia* opposita, magis minusve subrosulata, obovato-oblonga vel spathulata, fere petiolata, 2–3·5 cm. longa, ·9–1·4 cm. lata, subcarnosa. *Flores* in cymas ramosas corymbiferas multiflores dispositi; rami ·8–1·2 mm. longi, pedicelli circiter 1 mm. longi. *Calyx* 6–7 mm. longus, segmentis ellipticis acutis carinatis. *Corollae* tubus circiter 6 mm. longus; lobi 1–1·2 cm. longi, 3-3·5 mm. lati, anguste ovati, elongati, subacuti vel apiculati. *Filamenta* 1 mm. longa; antherae 3 mm. longae, apice glandula conspicua instructae. *Stylus* 6-7 mm. longus, prope basin biglandulosus, stigmate capitato.

Orange River Colony. Marsh near Harrismith, alt. 7000 ft., *Sankey*, 173 !

A pretty species, with comparatively large bright-yellow flowers borne on more or less dense and many-flowered corymbose inflorescences; the leaves tend to be gathered into false radical rosettes with one or two pairs of fairly large leaves on the erect flowering branches.

Sebaea (Pentandria) elongata, *E. Mey.*, Comm., 1837, 184; Gilg in Engl. Bot. Jahrb., xxvi., 96; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 41.

Sebaea cuspidata, Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 28.

Cape Colony. Riversdale Div.: Kampsche Berg, *Burchell*, 7085 ! mountains near Riversdale, 1500 ft., *Schlechter*, 1840 ! Oudtshoorn Div.: Robinson Pass, *Bolus*, 12993 ! Knysna Div.: on a mountain near Roodemuur, between Plettenbergs Bay and Lange Kloof, 2000–2500 ft., *Drège*, 2827 ! Uniondale Div.: mountains near Avontuur, *Bolus*, 2402 !

A distinct species with its false rosette of closely placed leaves at the base of the tall erect flowering stems. This species with which *S. cuspidata*, Schinz, has been united shews a considerable range of variation both in the size of the corolla and in other parts of the flower, but as there is a regular gradation of forms between

the larger-flowered specimens typical of the original *S. elongata* and the smaller-flowered forms which were referred by Schinz to *S. cuspidata*, there appears to be no good reason for retaining *S. cuspidata*, Schinz, as a distinct species.

Sebaea (Pentandria) rotundifolia, *A. W. Hill* [Gentianaceae-Exaceae]; species *S. elongatae*, E. Mey., et *S. Conrathii*, Schinz, proxima, a *S. elongata*, foliis orbicularibus cymis paucifloribus antheris triglandulosis stigmate clavato differt; a *S. Conrathii* foliis orbicularis segmentis calycis alatis floribus majoribus stigmate clavato differt.

Annua (?), erecta. *Caulis* circiter 12 cm. altus, simplex. *Folia* opposita, fere omnia sub-rosulata, orbicularia vel orbiculari-ovata, obtusa, 2·5–3·5 cm. longa, 1·5–3 cm. lata. *Flores* in cymam terminalem umbelliformem paucifloram dispositi; rami ·75–1·5 cm. longi, pedicelli 2 mm. longi, bracteis subulatis inconspicuis. *Calyx* 6 mm. longus, segmentis erectis elliptico-lanceolatis acutis alatis, alae ·5 mm latae, medio latissimae. *Corollae* tubus circiter 8 mm. longus; lobi 1·2 cm. longi, 5 mm. lati, ovati, unguiculati, obtusi. *Filamenta* 1·5 mm. longa; antherae 2·75 mm. longae, apice uni- basi bi-glandulosis instructae. *Stylus* 8–9 mm. longus, prope basin biglandulosus, stigmate clavato.

NATAL. Drakensberg, *Buchanan*, 31!

Sebaea (Pentandria) pentandra, *E. Mey.*, Comm. 1837, 184.

Sebaea gariepina, Gilg in Eng. Bot. Jahrb. xxvi., 1898, 90; Schinz in Mitteil. Geogr. Ges. Lübeck xvii., 1903, 41.

In E. Meyer, *Comm.*, vol. i., fasc. ii., 1837, p. 154, four localities (*a*, *b*, *c*, *d*) are given for *S. pentandra* collected by Drège and in *Zwei Pflanzengeogr. Doc.* (Meyer), pp. 93 and 219, a fifth locality (*e*) is referred to for *S. pentandra*. The localities, according to *Zwei Pflanzengeogr. Doc.*, should be as follows, and not as in Meyer's *Comment*.

(*a*) Winterveld & Nieuweveld.
(*b*) ad fontem Wonderheuvel.
(*c*) Garip Sandhügel am rechten Ufer des Flusses bei Verleptpram (v. Meyer, *Zwei Pflanzengeogr. Doc.*, 93).
(*d*) Zuurbergen.
(*e*) Inter Gekau et Basche.

Gilg in Engl. Bot. Jahrb. xvi., 1898, pp. 90, 91, states that he found three different plants in Meyer's herbarium under *S. pentandra*; he accordingly distributed them, retaining the plant from Gekau and Basche (*e*) under *S. pentandra*, and making a new species *S. gariepina*, Gilg, of the plant from near Verleptpram (*c*), whilst the third specimen from Zuurberg (*d*) is referred to *S. ramosissima*, Gilg.

From an examination of the type specimen in Meyer's herbarium at Lübeck, it has not been found possible to maintain the species *S. gariepina*, since this specimen from Garip (*c*) exactly equals *S. pentandra*, E. Mey. (*a*) from Nieuweveld at Kew.

With regard, however, to the localities for *S. pentandra* sensu stricto, a mistake appears to have arisen in the Berlin herbarium,

where on Drège's label the letter (*b*) has been read as (*e*) and the locality "Gekau and Basche" has accordingly been placed on the label instead of "Wonderheuvel."

The specimen from "Gekau-Basche" (No. 4920) at Lübeck agrees with the Berlin specimen from Wonderheuvel.

The Drège plants distributed under the name *S. pentandra*, E. Mey., are arranged as follows in the *Flora Capensis* :—

S. pentandra, E. Mey.; "Ad fontes Nieuweveld" (*a*); "Wonderheuvel" (*b*); "Garip" (*c*); and, "inter Gekau et Basche" (*e*).

S. ramosissima, Gilg; Zuurbergen (*d*).

It is of interest to notice that the floral structure of *Sebaea primulina*, A. W. Hill, from Kuruman, agrees very closely with that of *S. pentandra*, the chief difference being that the filaments of the anthers are inserted in the corolla-tube (section *Belmontia*) and not in the sinuses. In a few other cases there are equally striking cases of parallel species in the sections *Eusebaea* and *Belmontia* to which attention will be drawn.

Sebaea (Pentandria) primulina, *A. W. Hill* [Gentianaceae-Exaceae]; species distincta ex affinitate § *Belmontiae*, Schinz, foliis rosulatis, caulibus floriferis erectis singulis vel plurimis, segmentis calycis medio latissime alatis filamentis antherarum in tubo corollae insertis antheris conspicue triglandulosis insignis.

Annua, erecta. *Caulis* brevis, foliis rosulatim dispositis, caulibus floriferis erectis 4–13 cm. altis singulis vel plurimis. *Folia* opposita, radicalia ovata, subacuta, ·8–1·6 cm. longa, 4–7 mm. lata, subpetiolata, carnosa; caulina, par singulum, ovato-oblonga, subacuta. *Flores* in cymas laxifloras floribus paucis vel plurimis dispositi; rami ·8–2·5 cm. longi, pedicelli ·5–1 mm. longi, bracteis ovato-oblongis acutis vel linearibus. *Calyx* 7–8 mm. longus, segmentis ovato-lanceolatis acutis infra paullo connatis, anguste alatis, alae medio latissimae. *Corollae* tubus 1 cm. longus, lobi 7–8 mm. longi, 3–4 mm. lati, spathulati, obtusi. *Filamenta* ·5 mm. longa, in tubo corollae circiter ·75 mm. infra sinos inserta; antherae 2–3 mm. longae apice basique glandulis (3) conspicuis instructis. *Stylus* 8–9 mm. longus, versus basin biglandulosus; stigmate clavato magis minusve bilabiato.

BECHUANALAND. By the Moshowa River, near Takun, *Burchell*, 2252-5 ! between Kuruman and the Vaal River, *Cruickshank* (*in Herb Bolus*), 2540 !

This species bears a certain resemblance to specimens of *S. pentandra*, E. Mey., especially those collected near Kimberley by Flanagan, in the calyx-wings and in the anthers with their three glands. The position of the filaments, and the radical leaf-rosette, afford characters for separating this species from *S. pentandra*.

Sebaea (Pentandria) Schoenlandii, *Schinz* in Bull. Herb. Boiss. Ser. II., vi., 1906, 741.

Some confusion has occurred between this species and *S. sedoides*, Gilg, from which it differs in its relatively long internodes, ovate-lanceolate leaves and smaller and more compact inflorescences.

S. Schoenlandii has been placed by Schinz in his section *Belmontia*, but it has been found that the distinction between the sections *Eusebaea* and *Belmontia* apparently breaks down in this species, as in some examples the filaments of the anthers are inserted in the corolla-tube, whilst in others they occur in the sinuses. It has not been found possible to separate the individuals included under this species into two distinct species on this one character, or to include those forms with the anthers in the sinuses under *S. sedoides*, to which they are closely allied, and leave the remainder, with the filaments inserted in the tube as *S. Schoenlandii*.

The specimens included in this species are :—

NATAL. Mount Moreland, alt. 500 ft., *Wood*, 1386 ! without precise locality, *Cooper*, 2750 partly ! Zululand : Ngoya, *Wylie* (*in Herb. Wood*), 7570 ! 8497 !

ORANGE RIVER COLONY. Without precise locality, *Cooper*, 2751 !

TRANSVAAL. Witwaters Rand, *Hutton*, 880 !

Of these, *Cooper*, 2750, 2751, were placed by Schinz (*Mitteil. Geogr. Ges. Lübeck*, xvii., 1903, 43), under *S. sedoides*, Gilg. In 2751, however, the filaments of the anthers are inserted in the sinuses, and in 2750 in the tube of the corolla, otherwise they are indistinguishable. In all the other specimens the insertion of the filaments is in the tube of the corolla.

Sebaea (Pentandria) acuminata, *A. W. Hill* [Gentianaceae-Exaceae] ; species ex affinitate *S. longicaulis*, Schinz, a qua foliis angustioribus, cymis multifloribus, floribus minoribus, antheris brevissimis subsessilibus praesertim differt.

Perennis vel biennis, erecta. *Caulis* 50–65 cm. altus, simplex. *Folia* opposita, numerosa, infra ovato-lanceolata internodis aliquanto elongatis, supra lineari-lanceolata, conferta, acuta, marginibus reflexis, ·9–1·3 cm. longa, 2–4 mm. lata, subcoriacea. *Flores* in cymas terminales multifloras dispositi ; rami 1·0–1·7 cm. longi, tenues, pedicelli circiter 1 mm. longi, bracteis linearibus. *Calyx* 7 mm. longus, segmentis erectis anguste elliptico-lanceolatis acuminatis concavis anguste alatis. *Corollae* tubus 4–4·5 mm. longus ; lobi 5 mm. longi, 1·5–2 mm. lati, elliptico-obovati, obtusi. *Filamenta* brevissima, antherae 1-1·5 mm. longae, apice glandula instructae. *Stylus* 4 mm. longus, infra medium biglandulosus ; stigmate capitato-clavato.

NATAL. Near Boston, alt. 3,000–4,000 ft., *Wood* (*in Herb. British Museum*) !

In general habit this species is closely allied to *S. longicaulis*, Schinz, and is labelled on the sheet as being the same as *Wood*, 1844. It is, however, a much more slender plant, differing from *S. longicaulis* in its narrow leaves, acuminate sepals, as well as in the smaller proportions of the corolla and the short, nearly sessile, anthers.

Sebaea (Pentandria) erecta, *A. W. Hill* [Gentianaceae-Exaceae] ; species *S. longicauli*, Schinz, et *S. grandiflorae*, Schinz, proxima ; a *S. longicaule* foliis, segmentis calycis distincte alatis stigmate capitato, a *S. grandiflora* foliis segmentis calycis distincte alatis stylo biglanduloso differt.

Perennis vel biennis, erecta. *Caulis* 40–50 cm. altus, simplex, rhizomate repente ramoso subterraneo. *Folia* opposita, numerosa, infra magis minusve dense, supra sparse disposita, 8–10 mm. longa, 6–9 mm. lata, late ovata vel cordata, subacuta vel apiculata, subcoriacea. *Flores* in cymas terminales, paucifloras 5–9 dispositi, rami 1·2–1·8 cm. longi, pedicelli 2–4 mm. longi, bracteis subulatis vel linearibus. *Calyx* 1 cm. longus, segmentis erectis 4 mm. latis ovato-oblongis apiculatis conspicue alatis, alae ·5 mm. latae, medio latissimae. *Corollae* tubus 8 mm. longus, lobi 1·1–1·2 cm. longi, 5 mm. lati, obovato-oblongi, obtusi. *Filamenta* 2 mm. longa; antherae 3·5 mm. longae, apice glandula minuta instructae. *Stylus* 1 cm. longus, prope basin biglandulosus ; stigmate capitato.

Transvaal. Carolina District : Liliefontein, *Nicholson* (*in Transvaal Herbarium*), 4307 !

This species with *S. grandiflora*, Schinz, *S. longicaulis*, Schinz, *S. acuminata*, A. W. Hill, and *S. macrantha*, Gilg, form a small group of closely allied species.

Sebaea (Pentandria) longicaulis, *Schinz* in Bull. Herb. Boiss. II., 1894, 219 ; Gilg in Engl. Bot. Jahrb., xxvi, 1898, 94 ; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 42.

Sebaea Woodii, Gilg in Engl. Bot. Jahrb., xxvi., 94 ; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 42.

Sebaea crassulaefolia, Cham. et Schlecht., var. *lanceolata*, Schinz in Vierteljahrschr. Zürch. Naturf. Gesellsch., xxvii., 1891, 323.

Sebaea macrosepala, Gilg in Engl. Bot. Jahrb., xxvi., 91 ; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 48.

Cape Colony. King Williamstown Div. : Perie Bush, *Scott Elliot* ! Griqualand East : Mount Malowe, alt. 5500 ft., *Tyson*, 3096 !

Natal. In a swamp near Karkloof, alt. 3000–4000 ft., *Wood*, 4447 ! Byrne, in damp soil, alt. 3000 ft., *Wood*, 1844 ! Weston, Mooi River, *Rehmann*, 7348 ! near Ladysmith, *Gerrard*, 835 ! Benvie, *Wylie* (*in Herb. Wood*), 7875 !

This species appears to be closely allied to *S. grandiflora*, Schinz, and also to *S. erecta*, A. W. Hill, and *S. acuminata*, A. W. Hill, both in floral and in vegetative structure. The leaves in *S. longicaulis* tend to be ovate below, becoming lanceolate above, whilst in *S. grandiflora* they are cordate or broadly orbicular ovate ; in this latter species the stigma is capitate, and the stylar swelling is not always developed. It seems possible that intermediate forms may be found which will link together *S. longicaulis* and *S. grandiflora*.

Sebaea (Pentandria) macrophylla, *Gilg* in Engl. Bot. Jahrb. xxvi., 1898, 96 ; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 45.

Sebaea wittebergensis, Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 45.

Sebaea hymenosepala, Gilg ex Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 49 in part,

Cape Colony. King Williamstown Div.: Buffalo, near Perie, 4000 ft., *Tyson*, 1047 ! Kaffraria, *Mrs. Barber* ! Griqualand East ; summit of Mount Currie, alt. 6500 ft., *Tyson* (*in MacOwan & Bolus, Herb. Norm. Austr.-Afr.*) 1289*b* !

Orange River Colony. Kadzi Berg, Witteberg Range, *Rehmann*, 3999 ! Basutoland, *Cooper*, 713 !

Transvaal. Drakensberg Range, near Pilgrims Rest, in damp valleys, alt. 5000 ft., *McLea* (*in Herb. Bolus*), 171 ! 3099 !

I have been unable to find any valid distinction between *S. macrophylla*, Gilg, and *S. wittebergensis*, Schinz, and have therefore united them under one species.

Sebaea (Pentandria) crassulaefolia, *Cham. et Schlecht.* in Linnaea, i., 1826, 193 ; Schinz in Vierteljahrschr. Zürch. Naturf. Gesellsch., xxxvii., 323, (in part) ; Griseb. Gen. et Spec. Gent. 168, et in DC. Prodr. ix., 53 ; Gilg in Engl. Bot. Jahrb. xxvi., 97, (in part) ; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 50 (in part) ; non Baker et Brown in Flor. Trop. Africa, iv., 1, 547.

Sebaea hymenosepala, Gilg ex Schinz Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 49 (in part).

Cape Colony. Knysna Div. : Plettenbergs Bay Poort, *Mund and Maire* ! Uitenhage Div. : near Uitenhage ? alt. 1000-3000 ft., *Zeyher* ! *Ecklon-Zeyher* ! British Kaffraria, *Cooper*, 406 ! Without precise locality, *Ecklon*, 660 !

Sebaea crassulaefolia, Cham. et Schlecht., has been the favourite repository for most of the larger Sebaeas, and out of the material so placed several distinct species have been made. Amongst these may be mentioned *S. Brehmeri*, Schinz, which differs in the larger floral structures, capitate stigma and also in the numerous narrowly ovate, acute bracts of the inflorescence. *S. crassulaefolia*, as now restricted, is a somewhat slender plant, with lax, much branched and many-flowered inflorescences and with keeled or very narrowly winged calyx-segments and a shortly clavate stigma. In the *Flora of Tropical Africa* certain specimens are referred to *S. crassulaefolia* in the wider sense ; they are however quite distinct from this species. It seems fairly certain that *S. crassulaefolia* does not occur outside Cape Colony.

Sebaea (Pentandria) leiostyla, *Gilg* in Engl. Bot. Jahrb. xxvi., 1898, 97 ; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 32 ; Baker et Brown in Flor. Trop. Africa, iv., 1, 548.

Sebaea transvaalensis, Schinz in Mitteil, Geogr. Ges. Lübeck, xvii., 49.

Sebaea sedoides, Gilg ; Schinz in Mitteil. Geogr ; Lübeck, xvii., 43, in part.

Orange River Colony. Harrismith, *Sankey*, 175 ! Bethlehem, *Richardson* ! and without precise locality, *Cooper*, 2752 ! 2759 !

Transvaal. Houtbosch Berg, alt. 6400 ft., *Schlechter*, 4720 ! near Pretoria, damp places, alt. 4600 ft., *Schlechter*, 4157 ! Hooge Veld, between Trigardsfontein and Standerton, *Rehmann*, 6755 ! Reit Spruit, *Krook*, 2016 ! Ermelo Experimental Farm, dry laagte, alt. 5400 ft., *Burtt Davy*, 7710 ! near Vereeneging, in springy places, near Vlei, *Burtt Davy* !

NATAL. Ranges 30–60 miles from the sea, alt. 2–3000 ft., *Sutherland*! summit of Amajuba Hill, alt. 8000 ft., *Burtt Davy*, 7747 B! and without precise locality, *Gerrard*, 1983!

NYASALAND. *Buchanan*, 200! 270! North Nyasaland, *Whyte*! Shire Highlands, *Buchanan*, 208 A! near Blantyre, *Last*! *Adamson*, 236!

In this species the biglandular swelling on the style is usually very small and sometimes undeveloped. No character of any importance can be found to separate *S. leiostyla* and *S. transvaalensis*. *S. leiostyla* has therefore an extended range from Nyasaland to Natal through the Transvaal and into Orange River Colony. *Buchanan*, 270, the type of Gilg's species, appears to agree in all essentials with the other specimens quoted. Schlechter's plant 4720, collected in the Houtbosch Berg, which is the type of *S. transvaalensis*, Schinz, differs from other specimens only in its more bushy habit and numerous axillary inflorescences.

Sebaea (Pentandria) imbricata, *A. W. Hill* [Gentianaceae-Exaceae]; species distincta *S. Rehmannii*, Schinz, et *S. polyanthae*, Gilg, proxima cymis multifloris corymbosis segmentis calycis longioribus late imbricatis, prope basin nec versus medium alatis differt.

Perennis vel biennis, erecta. *Caulis* 17-25 cm. altus, simplex, versus apicem in cymas axillares ramosus. *Folia* opposita, numerosa, conferta internodis 6–12 mm. longis, orbiculari-ovata vel cordata, apiculata, 8–9 mm. longa, 11–9 mm. lata, sub-coriacea. *Flores* in cymas densas multifloras corymbosas dispositi; rami 6–8 mm. longi, pedicelli circiter 2 mm. longi, bracteis foliaceis ovatis vel lineari-ovatis. *Calyx* 9–10 mm. longus, segmentis erectis 3–4 mm. latis ovato-lanceolatis acuminatis ad basin late imbricatis alatis, alae 1 mm. latae ad basin latissimae. *Corollae* tubus 6–6·5 mm. longus; lobi 6·5–8 mm. longi, 3 mm. lati, eliptico-obovati, apiculati. *Filamenta* ·5–·75 mm. longa; antherae 2·5 mm. longae, apice glandula parva instructae. *Stylus* 7–8 mm. longus, prope basin biglandulosus; stigmate capitato-clavato.

NATAL. Summit of Amajuba Hill, alt. 8000 ft., *Burtt Davy*, 7747 C.!

Sebaea (Pentandria) hymenosepala, *Gilg*, in Engl. Bot. Jahrb, xxvi., 1898, 89; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903. 49, in part.

Sebaea semialata, Gilg in Engl. Bot. Jahrb., xxvi., 1898, 97; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 46.

Biennis vel annua (?), erecta. *Caulis* 15–28 cm. altus, e basi ramosus. *Folia* opposita, infra conferta, late orbiculari-ovata vel subreniformia, obtusa vel apiculata, 6–9 mm. longa, 8 mm.–1·2 cm. lata, subcoriacea. *Flores* in cymas numerosas axillares multifloras conferti; rami ·5–1·5 cm. longi, pedicelli 2–5 mm. longi, bracteis anguste ovatis vel linearibus. *Calyx* 5–8 mm. longus, segmentis erectis ovato-lanceolatis acutis alatis; alae membranaceae, ·75–1 mm. latae, sub medium latissimae. *Corollae* tubus 5–7 mm. longus; lobi circiter 6 mm. longi, 2–4 mm. lati, spathulati, paullo cucullati. *Filamenta* ·5–1·5 mm. longa; antherae 2–3 mm. longae apice unibasi minute bi-glandulosae. *Stylus* 6–7 mm. longus, versus basin biglandulosus; stigmate capitato vel brevissime clavato.

Cape Colony. Alexandria Div.: Zuurberg Range, *Bolus*, 9122! at Doon Nek and Bontjes River, alt. 2000–3000 ft., *Drège*! Albany Div.: near Grahamstown on mountain slopes, in moist places, alt. 2200 ft., *Galpin*, 375! *Atherstone*, 477! *Misses Daly & Sole*, 468! *Pappe*! Stockenstrom Div.: Katberg, *Shaw*! Komgha Div.: between Sandplaat and Komgha, alt. 2200–3200 ft., *Drège*, 4921! Transkei: Kreili's Country, *Bowker*! Valleys near Kentani, alt. 1000 ft., *Miss Pegler*, 906! Pondoland: near Umtamvuna, *Bachmann*, 1040! without precise locality, *Krebs*, 232! Griqualand East, Maclear Div.: near Klein Pot River, alt. 4500 ft., *Galpin*, 6774!

Sebaea hymenosepala, *Gilg*, var. **grandiflora**, *A. W. Hill*, a specie typica foliis numerosis reniformibus vel orbicularibus, internodis supra elongatis, cymis paucifloris aliquanto pendulis, segmentis calycis latioribus et lobis corollae 9 mm. longis, 6 mm. latis orbiculari-ovatis praecipue differt.

Cape Colony. Mount Fletcher Div.: Doodmans Kraus Mountain, Drakensberg Range, alt. 8850 ft., *Galpin*, 6776!

This variety is most closely related to Shaw's specimen from the Katberg.

Sebaea semialata, Gilg, has been united to *S. hymenosepala*, Gilg, after careful examination of all available material. The principal difference between the two species in the original descriptions appears to be in the anther-glands. *S. hymenosepala* is stated to have three anther-glands, whilst only one was found in *S. semialata*. The presence or absence of basal glands, however, appears to be liable to variation, and is not a sufficient justification for maintaining both species; they have therefore been united under the name *S. hymenosepala*, Gilg. This species is evidently closely allied to *S. Rehmanii*, Schinz, from the Transvaal. Both these species again are very similar to *S. Rudolfii*, Schinz, (§ *Belmontia*) in general appearance, but that is easily distinguished by the insertion and character of the anthers.

Of the other plants referred by Schinz (in Mitteil. Geogr. Ges. Lübeck, xvii., 49) to *S. hymenosepala*, Gilg, *MacOwan*, 16, has been referred to *S. fastigiata*, A. W. Hill; *Cooper*, 406, to *S. crassulaefolia*, Cham. et Schlect.; and *Cooper*, 713, to *S. macrophylla*, Gilg.

Sebaea (Pentandria) fastigiata, *A. W. Hill* [Gentianaceae-Exaceae]; species ex affinitate *S. hymenosepalae*, Gilg, caulibus multi-ramosis, foliis ovatis acutis antheris que longioribus praesertim differt.

Perennis vel biennis, erecta. *Caulis* 25–35 cm. altus ramis axillaribus numerosis instructus. *Folia* opposita, numerosa, conferta, late ovata, acuta, 8-10 mm. longa, 8–14 mm. lata, magis minusve coriacea. *Flores* in cymas axillares numerosas paucifloras laxe dispositi, ramis axillaribus elongatis foliaceis; rami inflorescentiae ·7–1·5 cm. longi, pedicelli 2–10 mm. longi, bracteis late ovatis acutis vel acuminatis. *Calyx* 7–9 mm. longus, segmentis erectis ovato-lanceolatis acuminatis alatis, alae ·5–·75 mm. latae, medio latissimae. *Corollae* tubus circiter 7 mm. longus; lobi 7–8 mm. longi, 3·5–5 mm. lati, obovati. *Filamenta* 1–1·5 mm.

longa; antherae 3–4 mm. longae, apice glandula basi glandulis nullis vel minutis instructae. *Stylus* 7–9 mm. longus, versus basin biglandulosus; stigmate capitato.

Sebaea crassulaefolia, Cham. et Schlecht.; Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 50, in part. *Sebaea hymenosepala*, Gilg ex Schinz in Mitteil. Geogr. Ges. Lübeck, xvii., 1903, 49, in part.

Cape Colony. George Div.: near George, *Prior*! Albany Div.: mountains near Grahamstown, alt. 2000 ft., *Zeyher*, 205! *Cooper*, 25! *MacOwan*, 16! Signal Hill, near Grahamstown, *Schönland*, 16! Howisons Poort, *Schönland*! Bathurst Div.: Port Alfred, *Miss Sole*, 468!

This species has been separated out from *S. crassulaefolia*, Cham. et Schlecht., and *S. hymenosepala*, Gilg, and appears to be well marked. Under these two species a number of diverse forms have been placed at various times and an attempt has been made to sort these out into their proper species.

Sebaea (Pentandria) procumbens, *A. W. Hill* [Gentianaceae-Exaceae]; species distincta ex affinitate *S. repentis*, Schinz, et *S. Thodeanae*, Gilg; a *S. repente*, Schinz, caulibus erectis floriferis, cymis capitatis multifloris antheris triglandulosis filamentis brevissimis aliquanto in tubo corollae insertis; a *S. Thodeana*, Gilg, cymis confertioribus, floribus minoribus glandulis terminalibus antherae flavis praesertim differt.

Perennis, procumbens. *Caulis* 5–10 cm. longus, ramosus, repens, caulibus floriferis erectis 5–7 cm. altis. *Folia* opposita, nunc sparsa nunc congesta, spathulata vel orbiculari-spathulata, subpetiolata, ·8–1·4 cm. longa, 6–8 mm. lata, subcarnosa. *Flores* in cymas capitatas densas multifloras dispositi; rami circiter 4 mm. longi, pedicelli brevissimi, bracteis late vel anguste ovatis. *Calyx* 6 mm. longus, segmentis erectis infra paullo connatis ellipticis vel obovatis apiculatis membranaceis dorso crasse carinatis vel anguste alatis. *Corollae* tubus 6 mm. longus; lobi 6–8 mm. longi, 3·5–4 mm. lati, spathulati, subacuti. *Filamenta* brevissima in sinubus vel paullo infra corollae sinos inserta; antherae 1·75–2 mm. longae, apice uniglandulosae, glandulae 1 mm. longae, flavae, basi biglandulosae. *Stylus* 5 mm. longus, prope basin biglandulosus; stigmate capitato.

Orange River Colony. Summit of Mont aux Sources, alt. 9500 ft., *Flanagan*, 2079!

This species, evidently closely related to *Sebaea repens*, Schinz, appears, like *S. Schoenlandii*, Schinz, to be on the border between the sections *Eusebaea* and *Belmontia*. It forms together with *S. repens*, Schinz, *S. Thodeana*, Gilg, *S. Marlothii*, Gilg, and probably *S. spathulata*, Steud., a small and somewhat isolated natural group of creeping or rosette-forming plants, which occur in the Drakensberg region. *S. procumbens*, A. W. Hill, is distinguished from *S. repens* and *S. Marlothii* by the erect inflorescence-stalks and dense capitate cymes; in which respect it shows similarity to *S. Thodeana* and *S. spathulata*. As in

S. repens, the apical glands of the anthers are yellow, whilst *S. Marlothii*, *S. Thodeana* and *S. spathulata* are characterised by the possession of black glands at the apices of the anthers.

With regard to the insertion of the filaments of the anthers, in *S. repens* this takes place in the sinuses of the corolla, in *S. procumbens* either in or just below the sinuses, in *S. Marlothii*, and *S. Thodeana* just below the sinuses, whilst in *S. spathulata* the filaments are inserted more or less deeply in the corolla-tube. *S. Thodeana* and *S. spathulata* appear to be somewhat different from the three other species as regards the texture and colour of the corolla, and they also tend to form definite rosettes of elongate spathulate leaves, whilst the allied species are essentially creeping in habit. *S. spathulata* is further easily marked off from the others in the character of its style, the apex of which is always below the base of the anthers, and in this character it shows affinity with the peculiar and anomalous creeping species *S. Thomasii*, Schinz, which should probably be also included in this group.

Sebaea (Pentandria) spathulata, *Steud.* ex Griseb., in DC. Prodr., ix., 1845, 53 ; Schinz in Bull. Herb. Boiss., ser. II., vi., 1906, 732.

Belmontia spathulata, E. Mey., Comm., 1835, 183 ; Griseb. in DC. Prodr., ix., 55.

Belmontia Flanaganii, Schinz, in Bull. Herb. Boiss., iii., 1895, 413.

Sebaea Flanaganii, Schinz, in Bull. Herb. Boiss., ser. II., vi., 1906, 737.

CAPE COLONY. Aliwal North Div. : Witteberg Range, alt. 7500 ft., *Drège* !

BASUTOLAND. Shady banks of Buffalo River, above the waterfall, alt. about 8100 ft., *Galpin*, 6778 ! summit of Mont aux Sources, alt. 9500 ft., *Flanagan*, 2080 ! Giant's Castle, alt. 6000 ft., *Guthrie* (*in Herb. Bolus*), 4881 ! Ruellenberg, *Flanagan*, 2080 !

I have no hesitation in referring *Sebaea Flanaganii* to *S. spathulata*, Steud., after having seen the type of the latter in Meyer's herbarium. The original specimen is in poor condition, and has lost the large black apical glands of the anthers, which are so characteristic of this species, but the scars are visible.

S. spathulata is somewhat variable in the size of its flowers and the depth to which the filaments of the anthers are inserted in the corolla-tube. It appears that *S. spathulata* possesses a short creeping stem, which bears rosettes of spathulate leaves.

S. spathulata is distinguished from all other Sebaeas, with the exception of *S. Thomasii*, Schinz, in having the apex of the stigma below the base of the stamens. The biglandular swelling also appears to be absent in both species. It is possible, however, that the functional stigma in these two species is morphologically the biglandular swelling almost universally found in other species of the genus, and that the style and stigma have not developed above the swelling. This point is at present under observation, but from the close similarity of *S. spathulata* to *S. Thodeana*, in which species the style and stigma with its swelling is quite typical

of *Sebaea*, it seems possible that the explanation offered above may be the true one. Both in *S. spathulata* and *S. Thodeana* the corolla is of a somewhat fleshy nature, and is of a texture unlike that usually met with in the genus.

Sebaea (Pentandria) Thomasii, *Schinz* [Gentianaceae-Exaceae] in Bull. Herb. Boiss., ser. II., iii., 1906, 743; descr. emend. et ampl., *A. W. Hill.*

Species distinctissima, nulli arcte affinis, habitu procumbens vel more *Gentianae* floribus conspicuis solitariis stylo breve insignis.

Perennis vel biennis, procumbens. *Caulis* ramosus, repens, aliquanto radicibus e nodis instructus, 12–22 cm. longus vel adscendens, 1–4 cm. altus. *Folia* opposita, numerosa, nunc sparsa, internodis ·6–1·2 cm. longis, nunc congesta, rosulata more *Gentianae vernae*, L., ovata vel orbiculari-ovata, ·8–1·4 cm. longa, 4 mm.–1·2 cm. lata, obtusa vel subacuta, paullo apiculata, coriacea, supra vernicosa. *Flores* plerumque solitarii terminales. *Calyx* 1·1–1·2 cm. longus, segmentis erectis elliptico-lanceolatis acuminatis crasse carinatis infra in tubum brevem connatis. *Corollae* tubus cylindricus, 1·2–2·2 cm. longus; lobi 1·0–1·3 cm. longi, 6–8 mm. lati, ovato-unguiculati, acuti. *Filamenta* 1 mm. longa, infra sinos corollæ 3–6 mm. inserta; antherae 2·5–3 mm. longae, apice glandula flava stipitata ·75–1·0 mm. longa, basi glandulis duabus minoribus instructae. *Stylus* circiter 4 mm. longus, stigmate clavato, 2–3·5 mm. longo; apice staminum insertionem haud attingente. *Capsula* ovoidea. *Semina* parva.

Parasia Thomasii, S. L. Moore in Journ. Bot., xxxix., 1901, 260, et in Journ. Bot., xlv., 1907, 154.

Cape Colony. Fort Beaufort Div.: top of the Winterberg Range, *Fraser*!

Orange River Colony. Mont aux Sources, in damp places, alt. 6500–10000 ft., *Flanagan* (*in Herb. Bolus*), 8215! *Bolus*, 10664, partly! without precise locality, *Pateshall Thomas*!

Natal. Tabamhlope, alt. 6000 ft., *Wylie* (*in Herb. Wood*), 10639! Giants Castle Pass, alt. 8–10000 ft., *Wylie* (*in Herb. Wood*) 10639! Giants Castle, alt. 8000 ft., *Guthrie* (*in Herb. Bolus*), 4882, partly!

This species is the most distinct member of the genus *Sebaea* and in general appearance hardly suggests that it should be placed in the genus. It is a very variable plant, with either long procumbent stems rooting at the nodes, or forming small rosettes very similar in appearance to plants of *Gentiana verna*, and in either case the shoots are terminated by a single flower (rarely two flowers). The flower, however, is similar to that of *S. spathulata*, Steud., both as regards the position of the anthers with their large apical glands, which are yellow, and in the style, the apex of which is situated at some distance below the base of the anthers. It seems possible that in this species the normal stigma characteristic of *Sebaea* is not properly developed. In spite, therefore, of its singular appearance the plant must be placed in the genus *Sebaea*. It may be considered to be the most peculiar of the interesting group of creeping and rosette-forming species which have been collected on the borders of Natal and the Orange River Colony.

As the species was originally described by Moore from a single specimen, which was not seen by Schinz, it has seemed advisable to give a fresh diagnosis of the species from an examination of a more complete series of specimens.

EXOCHAENIUM, *Griseb. in DC. Prodr.* ix., 1845, 55 ; *Schinz in Bull. Herb. Boiss.*, ser. II., vi., 1906, 744.

This genus is distinguished from *Sebaea* owing to the presence of a ring of disk-scales between the calyx and the corolla. The stamens are inserted in the corolla-tube. The style also does not possess the biglandular swelling typical of *Sebaea*, and the stigma is elongate-clavate.

The genus includes 11 species in Tropical Africa, with one species, *E. grande*, Griseb., in Natal, Orange River Colony and Transvaal.

Exochaenium was distinguished from *Belmontia*, E. Mey., by Grisebach, owing to the character found by him in the anthers :— "Antherae erectae, loculorum pariete interna inter se connatae, rima inde extrorsum aperta dehiscentes," v. Griseb., in DC. *Prodr.*, ix., 55 ; Benth. et Hook. *Gen. Plant.* ii., 804. As this observation was not confirmed either by Welwitsch or by Bentham and Hooker, the genus was not maintained in the *Genera Plantarum*. Grisebach's genus, as has been stated above, was made to receive the single species *Belmontia grandis*, E. Mey., a heterostyled plant. It seems clear that Grisebach must have examined only the long-styled flower, in which the anthers are concrescent and extrorse (v. fig. B, 4), and that both Welwitsch and Bentham and Hooker found only the short-styled flowers in which the anthers are always free (v. fig. A, 1). The genus *Exochaenium*, however, is not re-established in the *Flora Capensis* on such slender grounds, since the concrescent extrorse anthers appear to occur in only about two species of the genus.

The genus *Exochaenium* is subdivided by Schinz in *Bull. Herb. Boiss.*, vi., 1906, 745, into two sections *Euexochaenium* and *Pseudotachiadenus*. These divisions are useful, and, as I have included certain species not given by Schinz, and excluded one species from the genus, I append below a list of the species which I consider belong to *Exochaenium*.

Section **Euexochaenium**, Schinz.
E. grande, Griseb.
E. macranthum, A. W. Hill.
E. primulaeflorum, Welw.
E. zambesiacum, A. W. Hill.
E. debile, Welw.
E. platypterum, Schinz.
E. pumilum, A. W. Hill.

Section **Pseudotachiadenus**, Schinz.
E. chionanthum, Schinz.
E. Baumianum, Schinz.
E. gracile, Schinz.
E. Teuszii, Schinz.

Of these species, *E. grande*, *E. macranthum*, and *E. primulaeflorum* are dimorphic.

E. gracile and *E. grande*, var. *homostylum*, have stigma and anthers at the same level.

E. Baumianum has long-styled flowers, whilst in *E. debile*, *E. platypterum*. *E. pumilum*, *E. chionanthum*, and *E. Teuszii* the flowers have short styles. From the scanty material it is not possible to say whether any other species are dimorphic, though it seems highly probable that two forms of flower will be found in the larger flowered species.

Exochaenium Mechowianum, Schinz in Bull. Herb. Boiss., vi., 1906, 808, has been omitted from the list given above. This plant was described under the name of *Belmontia Mechowiana*, Vatke fide Schinz in *Vierteljahrschr. Naturf. Gesellsch.*, xxxvii., 333, and placed under *Exochaenium* in *Bull. Herb. Boiss.*, vi., 1906, 808. It is, I believe, a species of *Tachiadenus*, both on account of the absence of the disk-glands at the base of the calyx, and more especially of the character of its elongated style, equal in length to the corolla-tube, with its short bilobed stigma some distance above the anthers.

The assignment of this plant from Angola to the genus *Tachiadenus* is of some interest, since all the other species of the genus have been found in Madagascar.

Tachiadenus Mechowianus, *A. W. Hill.*

Belmontia Mechowiana, Vatke ex Schinz in Vierteljahrschr. Naturf. Gesellsch., Zürich, xxxvii., 1891, 333 ; Baker et Brown in Flor. Trop. Africa, iv., 1, 553.

Exochaenium Mechowianum, Schinz, in Bull. Herb. Boiss., ser. II., vi., 1906, 808.

BENGUELLA. Bank of Hamba, near Gambo, *Mechow*, 503 !

Exochaenium grande, *Griseb.* in DC. Prodr., ix., 1845, 55 ; Welw. in Trans. Linn. Soc., xxvii., 1869, 49 ; Schinz in Bull. Herb. Boiss., ser. II., vi., 1906, 745.

Belmontia grandis, E. Mey., Comm., 1837, 183 ; Schinz in Vierteljahrschr. Naturf. Gesellsch., Zürich, xxxvii., 330 ; Baker et Brown in Flor. Trop. Africa, iv., 1, 1904, 533, in part.

Sebaea grandis, Steud., Nom., ed. 2, 1841, 550.

Parasia grandis, Hiern. Cat. of Welw. Afr. Pl., part iii., 1898, 707 ; var. *major*, Moore in Journ. Bot., 1902, 384.

Exochaenium grande, Griseb., var. *major*, Schinz in Bull. Herb. Boiss., ser. II., vi., 1906, 802.

CAPE COLONY. Transkei : Tsomo, *Mrs. Barber*, 856 ! Tembuland : Bazeia, alt. 2000 ft., *Baur*, 155 ! Pondoland : between Umtentu River and Umzinkulu River, below 500 ft., *Drège* !

ORANGE RIVER COLONY. Thaba'Nchu, *Burke*, 205 ! *Miss Trollops* ! Free State Flats, *Mrs. Barber* ! near Harrismith, alt. 5500 ft., *Sankey*, 176 ! between Rhenoster River and Vaal River, *Mrs. Barber*, 626 ! and without precise locality, *Zeyher*, 1192 ! *Cooper*, 2758 !

BASUTOLAND. Damp localities by the Caledon River, *Mrs. Barber*, 20 ! *Hall* !

Transvaal. Boschveld, between Elands River and Klippan, *Rehmann*, 5061 ! Hoogeveld, near Donkers Hoek, alt. 4700 ft., *Rehmann*, 6534 ! *Schlechter*, 4137 ! Zuikerbosch Kop, Steenkamps Berg, *Nelson*, 390 ! near Lydenburg, *Wilms*, 969 ! Umdomati Valley, near Barberton, alt. 4000 ft., *Galpin*, 1291 ! Matsaba, in damp places, alt. 2000 ft., *Schlechter*, 4581 ! near Johannesburg, *Rand*, 1227 ! between Pretoria and Irene, *Burtt Davy*, 25 ! Belfast, *Burtt Davy*, 1290 ! Ermelo Experimental Farm, alt. 5400 ft., *Burtt Davy*, 7724 ! Liliefontein in Carolina District, *Nicholson* (*in Transvaal Herbarium*), 4309 ! and without precise locality, *McLea* (*in Herb. Bolus*), 5711 !

Natal. Coast-land, lat. 30° S., *Sutherland* ! between Attercliffe and Botha's Hill, alt. 600–1500 ft., *Sanderson*, 98 ! Noods Berg, alt. 2000 ft., *Wood*, 109 ! in grass-fields, &c., alt. 2000 ft., *Wood*, 247 ! near Tugela, *Gerrard*, 782 ! and without precise locality, *Sanderson*, 292 ! *Gerrard*, 253 ! *Cooper*, 2754 ! Zululand : Isandhlwana, *Patteshall Thomas* !

Lower Guinea. Angola : Huilla, near Lopollo, *Welwitsch*, 1516 !

Var. **homostylum**, *A. W. Hill*, formae typicae caulibus foliisque simili ; caulibus saepissime longioribus foliis minoribus superioribus saepius lineari-lanceolatis ad 1 cm. longis ; floribus saepisissime albidis rarius flavis ; segmentis calycis 1–1·6 cm. longis ; corollae tubo 1–1·4 cm. longo, lobis 5–8 mm. longis, 2–4 mm. latis, ovato-lanceolatis acutis ; antheris 1–1·5 mm. longis glandulis minoribus ; filamentis crassioribus supra basin tubi 6–7 mm. insertis, stylis 5 mm. longis, stigmate circiter 3 mm. longo inter antheras nidulante.

Belmontia natalensis, Schinz in Bull. Herb. Boiss., ii., 1894, 220.

Sebaea natalensis, Schinz in Bull. Herb. Boiss., ser. II., vi., 1906, 732.

Natal. Inanda, Eisbumbini, alt. 1800 ft., *Wood*, 133 ! Inanda, *Wood*, 541 ! Clairmont, near Durban, alt. 20 ft., *Wood*, 6100 ! near Durban, *Drège*, 4919 partly ! damp ground near Pinetown, alt. 800 ft., *Wood*, 657 ! Noodsberg, *Wood*, 922 ! moist pastures near Umzinto, *M'Ken*, 15 ! and without precise locality, *Sanderson*, without number ! and 292 partly ! Zululand : Ngoya, alt. 1000–2000 ft., *Wood*, 9322 !

Exochaenium grande is very variable in general appearance ; sometimes the plants are tall and slender, some 16 or more inches high, at others they are dwarf plants of not more than $2\frac{1}{2}$–3 inches in height. In the former case there is usually a branched inflorescence with some five or more flowers, whilst in the case of the smaller plants there may not be more than a single terminal flower. The flowers are large and striking, and as Schinz* has already shown, are heterostyled. In both the long- and short-styled flowers the filaments of the anthers are inserted about 6 mm. above the base of the corolla-tube. In the short-styled flowers the anthers are from 2–2·5 mm. long with a large conical stipitate gland 1·75–2 mm. long and two smaller basal glands ; the filaments are

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* *Vierteljahrsch. Naturf. Gesellsch, Zürich*, xxxvii, 330 ; *Bull. Herb. Boiss.*, ser. II., vi., 1906, 746.

stout and from 5·5–6 mm. long. The style is only 3·75–4 mm. long with the papillate stigma forming 2·5–3 mm. of its length, and the top of the stigma does not reach beyond the base of the anther filaments.

The long-styled flowers show some interesting points of difference for the anthers which are rather smaller, being 1·75–2 mm. long and having smaller glands, are syngenesious, opening extrorsely, and form a ring round the base of the style. The style is 9 mm.–1 cm. long with a stigma 5 mm. long, and the stigmatic surface is well above the anther lobes.

A similar state of affairs is met with in *Exochaenium primulaeflorum*, Welw., which is also dimorphic, with the anthers syngenesious in the long-styled flowers (v. Figs. E. and F.). *E. macranthum*, A. W. Hill, however, differs from these two species in not having syngenesious anthers. The variety *homostylum*, A. W. Hill, of *E. grande* is of interest since in this form the stigma is on a level with the anthers, and the flowers are intermediate in character between the long- and short-styled forms. The flowers are smaller than in *E. grande* proper and the corolla is commonly white, but the plants do not appear to be specifically distinct from *E. grande*. This form has been described by Schinz in *Bull. Herb. Boiss.*, ii., 1894, 220, as *Belmontia natalensis*, and was transferred to *Sebaea* in *Bull. Herb. Boiss.*, vi., 1906, 732 (v. Figs. G., 16).

E. grande appears to be mainly a southern form, and all the tropical specimens, with the exception of Welwitsch's plant from Huilla, have been placed under *E. macranthum*.

Sebaea zambesiaca, Schinz, described by Baker as *Belmontia zambesiaca* in *Kew Bull.*, 1894, 25, is evidently a species of *Exochaenium* and closely allied to *E. macranthum*; from the small single specimen it is not possible to say whether it is a distinct species or not.

Exochaenium macranthum, *A. W. Hill* [Gentianaceae-Exaceae]; species ex affinitate *E. grandis*, Griseb., floribus minoribus, corollae lobis ovato-lanceolatis, antheris glandulisque minoribus antheris in floribus brevi-staminibus liberis differet.

Annua, erecta. *Caulis* simplex, 10–24 cm. altus, supra ramis axillaribus floriferis instructus. *Folia* per paria 3–6 decussatim disposita, inferiora minuta vel subulata, superiora 1·5–2·5 cm. longa, ·8–1·2 cm. lata, elliptico-ovata vel lanceolata, acuta. *Flores* solitarii vel in cymas laxas foliaceas pancifloras dispositi, heterostyli. *Calyx* ·9–1·4 cm. longus segmentis erectis lanceolatis acutis vel acuminatis alatis, alae 1–1·5 mm. latae versus basin latissimae. *Corollae* tubus 1·2–1·6 cm. longus, infra suburceolatus, supra infundibuliformis; lobi 7 mm.—1 cm. longi, 3–4·5 mm. lati, anguste ovato-lanceolati, acuti. *Filamenta* in tubo corollae 6–8 mm. supra basin inserta, in floribus brevi-staminibus circiter ·5 mm. longa, crassiora, in floribus longi-staminibus 3–3·5 mm. longa, crassa; antherae 1·25–1·75 mm. longae filamentis longis, majores 3-glandulae, apice glandulis ·5–·75 mm. longis. *Stylus* in floribus omnibus 4–6 mm. longus, in floribus longi-staminibus paullo brevior, stigmate 3·5–5 mm. longo, elongato-clavato, papilloso.

Belmontia grandis, Baker et Brown in Flor. Trop. Africa, iv. 1, 553, in part.

Exochaenium grande, Schinz in Bull. Herb. Boiss., ser. II., vi., 745, 802 in part.

TROPICAL AFRICA. Nile Land: Uganda; Ankole, *Doggett*! Buddu, alt. 4100 ft., *Brown*, 139! Mozambique Dist.: Portuguese East Africa; Medo country, between Lajenda River and Ibo, *Last*! Macequeci, 2000 ft., *Johnson*, 260! Nyasaland; Nyika Plateau at Mwanemba, alt. 8000 ft., *McClounie*, 98! at Mymkowa, 8000 ft., *McClounie*, 126! Angola: Longa River, 4000 ft., *Baum*, 640!

This species shows close external similarity to *E. grande*, Griseb., but appears to be a distinct form. The flowers are smaller, the petals especially being narrower and the anthers are never fused together as in the short-stamened flowers of *E. grande*. The anther-glands are smaller and orbicular-ovate, and the style is always shorter than in the long-styled flowers of that species. The flowers of *E. macranthum* are peculiar in that, although they are dimorphic, they are not properly heterostyled. In all the flowers examined the style is of about the same length—though in the flowers with long stamens it is usually somewhat shorter than in the short-stamened flowers—but the filaments of the anthers may be either short, about ·5 mm. long, or long, about 3–3·5 mm. long. The result in these cases is that in the flowers with short stamens, the stamens are on a level with the lower part of the stigma, whilst in the flowers with long stamens the stamens are above the top of the stigma. This condition of affairs is quite different from *E. grande* and *E. primulaeflorum*, where the flowers are properly heterostyled, and long and short styles are found in correspondence with the long or short stamens (v. Figs. C. and D.).

In *E. macranthum* the filaments of the stamens are always found to be inserted at from 6–8 mm. from the base of the corolla-tube in either condition of the flower, and it is the length of the filaments which determines the position of the anthers. The filaments are always stout. The stout filaments and the free anthers in the short-stamened flowers of this species are in marked contrast to the condition of affairs in the long-styled flowers of *E. grande* and *E. primulaeflorum* (v. Figs. E. and F.). In these two species the anthers in the long-styled flowers are syngenesious and open extrorsely and the filaments are very delicate (cf. Figs. 3, 4, 13 and 14). The flowers of *E. macranthum* approach most nearly those of the var. *homostylum*, A. W. Hill, of *E. grande*.

A. W. HILL.

EXPLANATION OF PLATE.

A. *Exochaenium grande*, short-styled flower.
1. Flower showing anthers with stout filaments and glands and the short style × 1½.
2. Stamen showing glands and mode of dehiscence.

B. *E. grande*, long-styled flower.
3. Flower showing the syngenesious anthers and the long style × 1½.

4. The fused anthers with their glands seen from inside, the anthers open extrorsely.
5. The anthers partly in section, more highly magnified, showing the mode of fusion and the extrorse dehiscence.

C. *E. macranthum*, flower with long stamens.
6. Flower showing the long stamens, with relatively small anther-glands × 1½.
7. Stamen, back view, showing the attachment of the filament.
8. Stamen, front view, showing the introrse dehiscence of the anther.

D. *E. macranthum*, flower with short stamens.
9. The short stamens are free, have stout filaments, and the anthers open introrsely × 1½.
10. An anther showing introrse dehiscence.

E. and F. *E. primulaeflorum*.
11. A short-styled flower × 1½.
12. A single stamen, showing the mode of attachment of the filament and the elongated apical anther-gland.
13. The anthers of the long-styled flower, showing the lateral fusion × 2.
14. As fig. 13 × 6, the anthers are syngenesious and open extrorsely, the filaments are very short and the anther-glands are elongated.
15. The style and ovary of the long-styled flower.

G. *E. grande*, var. *homostylum*.
16. The flower showing the anthers on a level with the stigma × 1½.
17. A back view of an anther.
18. Anther, front view showing dehiscence.

XLV.—NOTES ON CHIRONIA AND ORPHIUM.

Some divergence of view has obtained as to the limitation of the Gentianaceous genera *Chironia*, Linn., and *Orphium*, E. Mey. As to *Chironia*, authors are not always in harmony in their descriptions of certain species; sometimes, even when the descriptions agree, the citations are not in accord.

While the delimitation of the species is, as a rule, easy, bibliographical difficulties occasionally leave the incidence of particular names so uncertain that it has been necessary to ascertain the identity of the actual specimens, when these exist, that have been made use of by different authors.

The material studied in attaining this end has included, in addition to the specimens in the Kew Herbarium, those preserved in the following collections:—Berlin (including Herb. Willdenow); Dr. Bolus; British Museum (including Herb. Sloane); Brussels; Cambridge; Mr. De Candolle; Dublin (including Herb. Harvey); Edinburgh; Geneva (Herb. Delessert); Goettingen; Leiden; Linnean Society (Herb. Linnaeus); Lübeck; Oxford; Paris (including Herb. Lamarck); Stockholm (including Herb. P. J. Bergius); Transvaal (Dept. Agric. Herb.); Upsala (including Herb. Thunberg); Vienna (Hof-Museum); Zürich. The warm thanks of Kew are due to the keepers and owners of these public and private collections for the readiness with which help has been accorded.

The results of this study, as regards bibliography and distribution, will be found briefly stated in the concluding part of Sir W. T. Thiselton-Dyer's *Flora Capensis*, vol. iv., sect. 1. Exigencies of space forbid a full statement there of the evidence on which these

results are based. This evidence is given here, and in its presentation the limitation and subdivision of the genera and the incidence of the names applied to their species are separately considered. As bearing equally upon, and as linking these two distinct questions, a conspectus of the *Chironiineae*, to which both genera belong, is intercalated, while the notes conclude with a statement of the synonymy of the African plants that have been referred to *Chironia*. For the synonymy of such extra-African species as have been placed in that genus reference may be made to the *Index Kewensis*.

Chironia, Linn., as established in 1737, was not a natural genus; four of the seven species enumerated by Linnaeus in 1753 (*Sp. Pl.*, pp. 189, 190) belong to *Exacum* or to *Sabbatia*. Lamarck, Persoon, and Willdenow were equally undetermined. The last-named writer in 1797 enumerated sixteen species, of which nine belong to *Exacum*, *Sabbatia*, or *Erythraea*. Its confusion with these alien genera was ended in 1810 when R. Brown, in a passing note (*Prodr. Fl. Nov. Holl.*, i., p. 451), first placed *Chironia* on a sound footing.

Brown was not the earliest author to realize the unsatisfactory nature of *Chironia* as established by Linnaeus. Necker in 1790 (*Elem.*, ii., p. 32) proposed a genus *Valerandia* to include some of the Linnean species, and in dealing with what he considered *Chironia* proper, Necker further (*ibid.* p. 33) excluded from the genus the only species that has a berry-like fruit. Necker looked on this species, *C. baccifera*, Linn., as entitled to generic rank, but suggested no generic name; this was done by Moench in 1802 (*Meth. Suppl.*, p. 212), when he termed it *Roeslinia*. This treatment of *C. baccifera* is probably defensible; it has, however, rarely been adopted, and although the status of a section accorded to *Roeslinia* by Endlicher in 1838 (*Gen. Pl.*, p. 601) is inadequate, the case is perhaps, for the moment, sufficiently met by the recognition of *Roeslinia* as a sub-genus of *Chironia*.

Brown, besides being the first to establish *Chironia* as a natural genus, was the first to suggest its further subdivision; five of his seven species were treated as § *Legitimae*; the other two, *C. baccifera* (*Roeslinia*, Moench) and *C. frutescens* (now *Orphium*, E. Mey.), were termed § *Dubiae*. Chamisso in 1831 (*Linnaea*, vi., pp. 343, 344) followed Brown, for § *Verae*, Cham., and § *Legitimae*, R. Br., are the same thing, as are also § *Spuriae*, Cham., and § *Dubiae*, R. Br. But, in defining his sections, Chamisso has stated that § *Spuriae* are species with berry-like fruits, a statement that is only correct as regards *C. baccifera*, not as regards *C. frutescens*, where the fruit is a capsule. Copying this treatment, G. Don in 1837 (*Gen. Syst. Gard.*, iv., p. 203), placed *C. frutescens* and its variety *augustifolia*, along with *C. baccifera*, in the genus *Roeslinia*. The error was corrected by Grisebach (*Gen. & Sp. Gent.*, p. 97) in 1839.

E. Meyer in 1837 (*Comm. Pl. Afr. Austr.*, ii., pp. 177–182) dealing with the South African material collected by Drège, broke up *Chironia*, as limited by Brown, into three genera:—(1) *Chironia*, in which he still retained *C. baccifera* (*Roeslinia*, Moench), one of the *Dubiae* of Brown or *Spuriae* of Chamisso. *C. frutescens*, the other member of the *Dubiae*, or *Spuriae*, was made the type

of (2) *Orphium*, E. Mey., distinguished from *Chironia* by having a crenate disk between the calyx and the corolla and having twisted anthers. The last genus, (3) *Plocandra*, was based on two species which agree with *Chironia* as regards absence of disk and with *Orphium* as regards twisting of anthers. *Plocandra*, E. Mey., has not stood the test of further investigation; it had to be relegated by Bentham and Hooker to *Chironia* (*Gen. Pl.*, ii., p. 805) in 1876. *Orphium*, E. Mey., was similarly replaced in *Chironia* by Kuntze in 1891 (*Rev. Gen.* p. 432); in this case, however, the necessity for reduction is less evident, and as *Orphium* has been maintained on different grounds both by Bentham and Hooker (*Gen. Pl.*) and by Gilg (*Engl. & Prantl Nat. Pflanzenf.*) we may with some safety accept it as entitled to generic rank. But it must not be concluded that on this account Kuntze's proposal has no justification; it is by no means clear that the characters relied upon in separating *Orphium*, E. Mey., from *Chironia* are more important than those which distinguish *Roeslinia*, Moench, from *Chironia*.

The genus *Chironia*, as limited by Meyer, was divided by him into three sections:—§ 1, with oblong capsule and narrowed corolla-throat; § 2, with oblong capsule and uncontracted corolla-throat; § 3, with globose berry-like fruit and narrowed corolla-throat. The third of these sections includes only *C. baccifera*, and therefore is equivalent to *Roeslinia*, Moench. In 1836, however, Rafinesque (*Fl. Tell.*, iii., p. 29) had already based on a species belonging to § 1 his genus *Eupodia*, and on a species belonging to § 2 another genus *Evalthe* (*ibid.* p. 77). Rafinesque's genera are, however, less distinct than Moench's genus *Roeslinia*, and the groups to which their types belong are certainly not entitled to more than sectional rank.

The definitions given by Meyer of the genera *Chironia*, *Orphium* and *Plocandra* were taken up in the following year by Endlicher (*Gen. Pl.*, pp. 601, 602). In the case of *Chironia* Endlicher adopted Meyer's sections, naming the first *Hippochiron*, the second *Euchironia*, the last *Roeslinia*, adopting in this case Moench's generic name for the one species it contains. There is a slight inaccuracy in Endlicher's citation of types, for Lamarck's plate (*Ill. Gen.*, t. 108, fig. 2) quoted under *Euchironia*. represents a *Hippochiron*. We learn from Endlicher that when he published these sectional names the monograph of the *Gentianaceae* on which Grisebach was engaged had not yet been issued.

When, in 1839, Grisebach's monograph (*Gen. & Sp. Gent.*) did appear, it showed that he had not had access, in preparing it, to Meyer's work of 1837, or to that of Endlicher. Grisebach relegated to *Chironia* the genus *Valerandia*, Neck., but did not associate it with any particular species. He still retained *C. frutescens* in the genus, but treated it as the type of a distinct section, (1) *Trachanthera*. A species, *C. Krebsii*, nearly allied to one of those included by Meyer in *Plocandra*, was treated as the type of another section, (2) *Pseudosabbatia*. Grisebach recognised a third section, (3) *Silenophyllum*, which is the same as *Hippochiron*, Endl. His remaining sections are (4) *Viscaria* and (5) *Linophyllum*, which together correspond to *Euchironia*, Endl.; and, finally, (6) *Roeslinia*, which corresponds in intention

to Moench's genus and Endlicher's section so named. But the limits of *Roeslinia*, Griseb., are less natural than those of *Roeslinia*, Endl., for it includes, along with *C. baccifera*, a species, *C. serpyllifolia*, Lehm., which Grisebach has accurately described as having a capsular, not a berry-like fruit. Meyer had already correctly referred this plant to the section *Hippochiron*, under the name *C. parvifolia*.

In 1845 Grisebach (*DC. Prodr.* ix., p. 39–44) modified his previous treatment by recognising *Orphium*, E. Mey., which corresponds to the section *Trachanthera*, Griseb., and *Plocandra*, E. Mey., which includes *Pseudosabbatia*, Griseb. The limitation of the remaining sections remained unchanged, but the name *Silenophyllum* was abandoned in favour of *Hippochiron*, Endl., and the names *Viscaria* and *Linophyllum* were altered to *Ixochiron*, Griseb., and *Linochiron*, Griseb., respectively. To the former he added *C. arenaria*, E. Mey., which is really a *Linochiron*. Grisebach, moreover, still retained in *Roeslinia*, Endl., the species *C. serpyllifolia*, Lehm., which is a *Hippochiron*.

Valerandia, Neck., which Grisebach in 1839 had included in *Chironia*, was in 1845 doubtfully referred by him to *Orphium*, a proposal at variance with that made by Endlicher in 1840 (*Gen. Pl. Suppl.*, p. 1399) when he, while recognising *Orphium* as distinct from *Chironia*, nevertheless referred *Valerandia* to the latter genus.

In 1876 Bentham and Hooker (*Gen. Pl.* ii., p. 805) pointed out that *Plocandra*, E. Mey., is not a distinct genus, and that *Roeslinia*, Moench, which most authors have retained in *Chironia*, is more entitled to separate consideration than *Plocandra*. No sectional subdivision of *Chironia* was suggested. *Orphium*, E. Mey., was accepted by Bentham and Hooker as a distinct genus, but as Knoblauch has shewn, the differential characters advanced, though accurate, are hardly adequate. The most distinctive character, not mentioned by Bentham and Hooker, is the presence of a prominent disk between the calyx and corolla in *Orphium*, whereas *Chironia* has no such disk. *Valerandia*, Neck., and its reference to *Orphium*, were alluded to, but no definite decision was advanced as regards the divergent views held by Grisebach and Endlicher.

In 1877 Oliver (*Hook. Ic. Pl.*, t. 1229) proposed a section *Xanthochiron* under *Chironia* for a new species, *C. exigua*, Oliv. This plant is, however, a *Sebaea*, so that the section *Xanthochiron* disappears.

In 1895 Gilg (*Eng. Nat. Pflanzenf.*, iv., 2, pp. 76–78) has again recognised *Orphium*, E. Mey., as a genus apart from *Chironia*, and has followed Bentham and Hooker in reducing *Plocandra*, E. Mey., to *Chironia*.

In the genus *Chironia* Gilg has recognised the four sections adopted by Grisebach in 1845, viz. :—*Hippochiron*, Endl.; *Ixochiron*, Griseb. ; *Linochiron*, Griseb., and *Roeslinia*, Endl. *Ixochiron* and *Linochiron* are delimited as they were by Grisebach. But *Hippochiron*, Gilg, is different from *Hippochiron* as understood by Meyer, Endlicher and Grisebach, since it not only includes the species that belong to the section, but those that belong to the equally natural section *Pseudosabbatia*, Griseb., and in addition

those species referable to the genus *Plocandra* as understood by Meyer that do not conform in character with the definition of *Pseudosabbatia*. At the same time *Roeslinia*, Gilg, is more unlike the natural group *Roeslinia*, Endl., which corresponds to Moench's original genus so named, than the composite section *Roeslinia*, Griseb. Gilg, following Grisebach, has retained in *Roeslinia* the species *C. serpyllifolia*, which is a *Hippochiron ;* he has further admitted to the section a species from Madagascar which belongs to another subgenus. Inadvertently Gilg has attributed to all the species included in the section a berry-like fruit. This is not the case as regards *C. serpyllifolia*, the fruit of which is a capsule, as Grisebach has described it. Adopting an accidental modification in its orthography used by Bentham and Hooker, Gilg has followed Grisebach in doubtfully reducing *Valerandia*, Neck., to *Orphium*, E. Mey.

Valerandia was proposed by Necker (*Elem.*, ii., p. 33), to include some of the species of *Chironia*, Linn. The diagnostic character of the genus is the existence in the flower of a ring of crenate scales. These scales, according to the sequence of characters in the definition, lie within the corolla. The one reliable diagnostic character of *Orphium*, E. Mey., is the existence of a crenate disk, not met with in *Chironia*. This disk lies outside the corolla. Therefore the existence of this disk, so far from suggesting that *Orphium*, E. Mey., may be the same as *Valerandia*, Neck., shows that *Valerandia* cannot be *Orphium*. The evidence to this effect does not end here. Necker has given a definition of *Chironia* (*Elem.*, ii., p. 34), as limited by him after (*a*) the segregation of whatever Linnean species he had placed in *Valerandia*, and (*b*) the exclusion of *C. baccifera* (*Roeslinia*, Moench). The diagnostic character of this restricted genus *Chironia*, Neck., is that the anthers are spirally twisted. Therefore *Chironia*, Neck., does not include any true *Chironia* enumerated by Linneaus, but is restricted to the three Linnean *Chironiae* which belong to the genus *Sabbatia*, Adans., and to *C. frutescens* which is *Orphium*, E. Mey. *Valerandia* then, as described by Necker, cannot be *Orphium*, E. Mey. ; *Chironia*, Neck., after the segregation of *Valerandia*, still included *C. frutescens*, Linn., the plant on which *Orphium*, E. Mey., is based.

The effect of Necker's diagnosis of *Chironia* is reflected in the description by Gaertner in 1791 (*Fruct.*, ii., p. 156), in which stress is laid on the character of twisted anthers. We know that *Chironia*, Gaertn., was less circumscribed than *Chironia*, Neck., for Gaertner included and partially figured the species *C. baccifera* which Necker had expressly excluded. The character of twisted anthers, as used by Necker, was probably quite diagnostic ; as employed by Gaertner, it is not so, for the anthers of *C. baccifera* are straight.

The suggestion of Endlicher, made in 1840, that *Valerandia*, Neck., is *Chironia*, Linn., is as untenable as that made by Grisebach in 1845. There is no ring of crenate scales within the corolla of any of the species belonging to the genus *Chironia* as limited by Endlicher himself in 1838. What *Valerandia*, Neck., may be does not concern the present enquiry ; it is sufficient here to show that *Valerandia*, Neck., cannot be *Orphium*, and cannot be *Chironia*,

Schoch, in monographing the genus *Chironia* (*Bot. Centralbl. Beih.*, xiv. pp. 177–242) in 1903, has not recognised the sections adopted by Gilg. He has not attempted to group the species, but has arranged them in a sequence based on the exigencies of an artificial key.

As might be expected in a genus where, as in *Chironia*, some of the forms are so nearly allied that they have been accorded now specific now only varietal rank, this arrangement is not always satisfactory. Considering in the first place those discrepancies which amount only to differences of opinion, it is found that the sequence adopted by Schoch occasionally divorces what are manifestly closely allied forms. Thus, *C. nudicaulis* (n. 8 of Schoch) and *C. lychnoides* (his n. 14) are both varieties of *C. jasminoides*, Linn.; *C. mediocris* (n. 12 of Schoch) is a variety of *C. arenaria* (his n. 17); *C. melampyrifolia* (n. 13 of Schoch) and *C. Schlechteri* (his n. 18) both belong to *C. laxa*, Gilg; *C. maxima* (n. 24 of Schoch) is identical with *C. rosacea* (his n. 32); *C. laxiflora* (n. 27 of Schoch) is the same as *C. rubro-coerulea* (his n. 29). In addition, however, we find that the artificial arrangement adopted by Schoch deviates unnecessarily from a natural sequence owing to certain inadvertencies. Thus, the fruit of *C. serpyllifolia* is stated to be berry-like, whereas it is, as Grisebach originally described it, a capsule; the leaves of *C. madagascariensis* are described by Schoch as glabrous, whereas they are, in the original specimens, pubescent; the whole plant in the case of *C. lancifolia* is said to be glabrous, whereas the stems, the leaf-veins, and the leaf-margins are scabridulous-hispid.

The species referred to *Chironia*, Linn., in the restricted sense proposed by Bentham and Hooker and adopted by Gilg and by Schoch, arrange themselves in three natural groups of apparently equal rank, but of very unequal size. The first of these, (1) *Roeslinia*, corresponds to the genus so named by Moench, and includes only one species, *C. baccifera*, rather variable in appearance, and fairly widely spread in South Africa. The group is characterised by having glabrous leaves and stems, and globular baccate fruits, which readily drop off, leaving behind the persistent calyx. The next group, (2) *Euchironia*, includes all the species from the African continent so far known, except *C. baccifera*. This group is characterised by having glabrous leaves and stems, though in one species, *C. Bansei*, the pedicels and calyx-tubes are faintly puberulous; the fruits are oblong not globose, and capsular not baccate. The two valves of the capsule are leathery, and remain, like the calyx, permanently attached to the torus; the valves moreover continue partially connate at the base, often also at the apex. The remaining group, (3) *Neochironia*, includes two species, *C. madagascariensis* (with a variety *pubescens*) and *C. lancifolia*, both confined to Madagascar. This group is characterised by having scabridulous-hispid or softly pubescent leaves and stems, and, where the fruit is known, by having ovoid capsules, the two valves of which are crustaceous when ripe, become completely separated from each other, and are ultimately detached from the torus, leaving behind only the persistent calyx. These three groups may be conveniently considered subgenera.

The central subgenus, *Euchironia*, calls for further subdivision. It has to be noted that this subgenus, *Euchironia*, is wider in its limits than the section *Euchironia*, Endl. Endlicher's *Euchironia* included only the sections *Linochiron*, Griseb., and *Ixochiron*, Griseb. The *Euchironia* here recognised includes, along with these, the section *Hippochiron*, Endl., and the genus *Plocandra*, E. Mey. The species within it arrange themselves naturally in six subordinate groups, which may be conveniently treated as sections. These sections are :—

1. *Linochiron*, Griseb., with six species ; *C. arenaria*, *Schinzii*, *emarginata*, *gracilis*, *Zeyheri*, *linoides*.

2. *Heterochiron*, with a single species : *C. Bansei*.

3. *Pseudosabbatia*, Griseb., with five species : *C. rosacea*, *transvaalensis*, *flexuosa*, *palustris*, *Krebsii*. The species last mentioned is the one on which Grisebach originally based this section.

4. *Plocandra*, with seven species : *C. humilis*, *erythraeodes*, *Baumiana*, *purpurascens*, *angolensis*, *Verdickii*, *laxiflora*. This section does not correspond in its entirety to the genus *Plocandra*, E. Mey., from which its name is taken ; it includes only those species referable to *Plocandra*, as that genus was defined by Meyer, which do not belong to *Pseudosabbatia*, Griseb.

5. *Hippochiron*, Endl., with seven species : *C. Peglerae*, *peduncularis*, *jasminoides*, *serpyllifolia*, *laxa*, *floribunda*, *maritima*.

6. *Ixochiron*, Griseb., with four species : *C. scabrida*, *tabularis*, *tetragona*, *melampyrifolia*.

Though tolerably well defined, the limits of these sections are less cleanly cut than those of the three higher groups. *C. maritima*, in *Hippochiron*, serves to connect that section with *Ixochiron ; C. Schinzii*, in *Linochiron*, links that section with *Ixochiron ; C. Peglerae*, in *Hippochiron*, serves to connect that section with *Plocandra*, while *C. Verdickii*, in *Plocandra*, links that section with *Hippochiron ; C. humilis*, in *Plocandra*, serves to connect that section with *Pseudosabbatia* ; finally *C. Bansei*, in *Heterochiron*, has characters in common with *Linochiron*, with *Hippochiron*, with *Pseudosabbatia* and, as regards its faint pubescence, even with the genus *Orphium*.

The limits of these natural groups have been obtained from a consideration of the sum of their common characters. It is interesting, therefore, to find that what appears to be the most natural grouping attainable traverses the evidence afforded by one particular character which impressed so able a worker as E. Meyer as being of generic value. It was largely owing to the fact that in certain species of *Chironia* the anthers become spirally twisted, as they do in the allied genus *Orphium*, that Meyer was led to propose his genus *Plocandra*. The character is certainly well marked in most of the species that compose the section *Plocandra*, as here limited. But even in this group there is one species, *C. Verdickii*, in which the anthers are almost straight. In the section *Pseudosabbatia*, however, one species of which was originally included by Meyer in the genus *Plocandra*, only two of the five species have very markedly spiral anthers. On the

other hand, in the section *Hippochiron*, where the anthers are usually straight, one species, *C. Peglerae*, in other respects a *Hippochiron*, has the anthers quite as twisted as in a normal *Plocandra*. Bentham and Hooker have indeed remarked that the anthers may at times be spiral in *C. peduncularis*. This does not appear to be the case in any specimen of *C. peduncularis* in Herb. Kew. It is, however, found from their specimens that *C. peduncularis*, Benth. and Hook. f. (*Gen. Pl.*, ii., p. 805), was not exactly Lindley's species so named, but included *C. rosacea*, Gilg, which is a *Pseudosabbatia*, and has somewhat twisted anthers. The true *C. peduncularis*, Lindl., was in part treated by Bentham and Hooker as a distinct species, *C. latifolia*, E. Mey.

In the subjoined conspectus of the *Chironiinae*, Gilg (*Engl. Nat. Pflanzenf.*, iv. 2, p. 76), which subdivision is confined to the genera *Orphium* and *Chironia*, the diagnostic characters of these genera and of the subordinate groups of species that compose the latter are given in detail; the characters that distinguish the varieties recognisable under certain of the species are shown in smaller type.

CHIRONIINAE

(Gilg in Engl. Nat. Pflanzenfam., iv., 2, 76).

Genus A.—**ORPHIUM.** *Calyx-lobes* obtuse, without keels. Crenulate *disk* between calyx and corolla. *Leaves* and *stems* usually pubescent.

A single species—S. Africa. *O. frutescens.*

Leaves flat ... ... *a. frutesceus, typica.*
Leaves semiterete ... ... *β.* var. *angustifolia.*

Genus B.—**CHIRONIA.** *Calyx-lobes* usually acute and usually keeled. No *disk* between calyx and corolla.

Subgenus I.—ROESLINIA. *Fruit* indehiscent, baccate, fleshy, readily separating entire from the torus; *leaves* and *stems* glabrous.

Section 1.—**Roeslinia.** *Calyx* 5-partite; *corolla-tube* cylindric, narrowed under limb; *anthers* straight; *ovary* obtuse, globose.

A single species—S. Africa. 1. *C. baccifera.*

Leaves linear; corolla-lobes not exceeding ¼ in. *a. baccifera, typica.*
Leaves narrow-linear; corolla-lobes exceeding ⅓ in. ... ... *β.* var. *grandiflora.*
Leaves narrow-oblong; corolla-lobes not exceeding ¼ in. ... ... *γ.* var. *Burchelli.*
Leaves subspathulate-oblong; corolla-lobes not exceeding ¼ in. ... ... *δ.* var. *dilatata.*

Subgenus II.—EUCHIRONIA. *Fruit* a 2-valved capsule, coriaceous, the valves usually not quite separated to the base, and remaining attached to the torus after the seeds are shed; *leaves* and *stems* glabrous.

Section 2.—**Linochiron.** *Calyx* 5-fid, rarely 5-partite; *corolla-tube* narrow-campanulate; *anthers* straight or faintly spiral; *ovary* obtuse, ovoid or oblong.

Stems diffuse; branches patent; calyx-lobes broad spreading:—
Calyx 5-partite, longer than corolla-tube; corolla-lobes obovate or suborbicular—S. Africa. 2. *C. arenaria.*

Leaves linear to lanceolate; corolla-lobes apiculate ... ... *a. arenaria, typica.*
Leaves narrow-oblong; corolla-lobes obtuse or retuse ... ... *β.* var. *mediocris.*

Calyx 5-fid, not longer than corolla-tube; corolla-lobes elliptic-lanceolate—S. Africa. 3. *C. Schinzii.*

Stems erect; branches erect or ascending; calyx 5-fid:—
Calyx longer than corolla-tube, with thick margins:—
Leaves narrow-linear or subulate:—
Calyx-lobes wide-triangular, obtuse or acute, erect overlapping and subauriculate at base—S. Africa. 4. *C. emarginata.*

Calyx-lobes narrow, acute or subobtuse, often slightly spreading, not subauriculate at base—S. Africa. 5. *C. gracilis.*

Calyx under ½ in. long, lobes lanceolate or narrow-oblong; leaves under 1 lin. wide *a. gracilis, typica.*
Calyx ½ in. long, lobes wide-triangular; leaves 1 lin. wide or wider ... ... *β.* var. *macrocalyx.*

Leaves narrow-spathulate; calyx-lobes rounded at apex, erect, not subauriculate—S. Africa. 6. *C. Zeyheri.*

Leaves ¼ in. wide ... ... *a. Zeyheri, typica.*
Leaves ⅛ in. wide ... ... *β.* var. *angustifolia.*

Calyx not longer than corolla-tube, lobes triangular with thin pale margins, acute, erect, not subauriculate at base; leaves linear—S. Africa. 7. *C. linoides.*

Section 3.—**Heterochiron.** *Calyx* 5-partite; *corolla-tube* cylindric; *anthers* faintly spiral; *ovary* subacute, ovoid; *pedicels* and *calyx-tube* externally faintly puberulous.

A single species—only known in cultivation. 8. *C. Bansei.*

Section 4.—**Pseudosabbatia.** *Calyx* 5-fid; *corolla-tube* cylindric; *anthers* from faintly to distinctly spiral; *ovary* acute, ovoid.

Stem-leaves in 4–8 pairs; radical leaves few, usually soon vanishing; panicles lax; anthers faintly spiral:—
Stem-leaves broad, over ½ in., ovate-lanceolate; corolla-lobes usually ovate, obtuse—S. Africa. 9. *C. rosacea.*

Stem-leaves narrow, under ⅓ in., lanceolate or linear:—
Calyx-lobes longer than tube; buds before opening over ½ in. long—Trop. Africa; S. Africa. 10. *C. transvaalensis.*

Calyx-lobes not longer than tube; buds before opening under ⅓ in. long—Trop. Africa. 11. *C. flexuosa.*

Stem-leaves in 1–2, rarely 3 pairs; radical leaves many, subrosulate, persisting; anthers distinctly spiral:—
Panicles lax, their branches spreading—S. Africa. 12. *C. palustris.*

Radical leaves obovate-spathulate ... ... *a. palustris, typica.*
Radical leaves oblanceolate ... ... *β.* var. *foliata.*

Panicles dense, their branches virgate ; radical leaves oblanceolate—S. Africa. 13. *C. Krebsii.*

Section 5.—**Plocandra.** *Calyx* 5-sect ; *corolla-tube* very short, limb large, campanulate ; *anthers* usually distinctly spirally twisted ; *ovary* acute, ovoid.

Radical leaves subrosulate, persisting ; panicle-branches erect or ascending :—

Stem-leaves nearly or quite as long as internodes ; primary peduncles short, never over $\frac{1}{3}$ in. long, usually much shorter ; leaves linear—Trop. Africa ; S. Africa. 14. *C. humilis.*

Stems simple ; radical leaves lanceolate ...	*a. humilis, typica.*
Stems more robust, often branched upwards ; radical leaves narrow-obovate	β. var. *Wilmsii.*

Stem-leaves shorter than internodes ; primary peduncles never under $\frac{1}{2}$ in. long :—

Stem-leaves oblong or lanceolate, semi-amplexicaul—Trop. Africa. 15. *C. erythraeodes.*

Stem-leaves lanceolate or linear, base cuneate—Trop. Africa. 16. *C. Baumiana.*

Radical leaves vanishing ; primary peduncles never under $\frac{1}{2}$ in. long :—

Panicle-branches erect or ascending—S. Africa. 17. *C. purpurascens.*

Leaves obovate to lanceolate ; flowers 1 in. across, all 5-merous	*a. purpurascens, typica.*
Leaves larger, oblong ; flowers 1 in. across, on secondary branches sometimes 4-merous ...	β. var. *Tysonii.*
Flowers larger, $1\frac{1}{2}$ in. across	γ. var. *impedita.*

Panicle-branches spreading :—

Stem-leaves usually nearly or quite as long as internodes, ovate-lanceolate or lanceolate, base cuneate :—

Anthers distinctly spirally twisted—Trop. Africa. 18. *C. angolensis.*

Anthers little twisted, markedly sagittate at base—Trop. Africa. 19. *C. Verdickii.*

Stem-leaves much shorter than internodes, wide-ovate, base rounded or cordate—Trop. Africa. 20. *C. laxiflora.*

Section 6.—**Hippochiron.** *Calyx* 5-sect ; *corolla-tube* cylindric, narrowed under limb ; *anthers* straight or rarely distinctly spirally twisted ; *ovary* acute, ovoid.

Leaf-bases rounded or cordate :—

Stems erect, strongly angular ; branches ascending ; calyx longer than the corolla-tube ; anthers distinctly spiral—S. Africa. 21. *C. Peglerae.*

Stems decumbent, terete ; branches spreading ; calyx not longer than corolla-tube ; anthers straight—S. Africa. 22. *C. peduncularis.*

Leaf-bases cuneate ; anthers straight :—

Stems erect, leaf-margins smooth :—

Stems simple or sparingly virgately branched above ; leaves and flowers large—S. Africa. 23. *C. jasminoides.*

Stems remotely leafy, leaves ovate-lanceolate to lanceolate ... ... *α. jasminoides, typica.*
Stems remotely leafy, leaves linear ... *β.* var. *viminea.*
Stems rather closely leafy throughout, leaves ovate-lanceolate ... ... *γ.* var. *multiflora.*
Stems rather closely leafy only below, leaves ovate to ovate-lanceolate ... *δ.* var. *tabularis.*

Stems much diffusely branched, leaves and flowers rather small :—

Leaves about $\frac{1}{3}$ in. long, not more than twice as long as broad—S. Africa. 24. *C. serpyllifolia.*

Corolla-lobes ovate-lanceolate, subacuminate; leaves ovate ... ... *α.* var. *serpyllifolia, typica.*
Corolla-lobes lanceolate, acuminate; leaves narrow-ovate, $\frac{1}{3}$ in. long ... *β.* var. *laxa.*
Corolla-lobes lanceolate, acuminate; leaves narrow-ovate, $\frac{1}{5}$ in. long ... *γ.* var. *microphylla.*

Leaves $\frac{3}{4}$ in. long or longer, at least four times as long as broad :—

Corolla-lobes acute—S. Africa. 25. *C. laxa.*

Corolla-lobes obtuse—only known in cultivation. 26. *C. floribunda.*

Stems below decumbent and rooting at the nodes; leaf-margins very minutely scabridulous; corolla lobes acute—S. Africa. 27. *C. maritima.*

Section 7.—**Ixochiron.** *Calyx* 5-fid, viscid; *corolla-tube* cylindric, uniform; *anthers* straight; *ovary* acute, ovoid; *capsule* viscid.

Stems erect; leaves cuneate at base :—

Calyx not longer than corolla-tube, its lobes narrow, acute or acuminate :—

Leaves more or less glandular-scabridulous, especially near margins—S. Africa. 28. *C. scabrida.*

Leaves oblong or elliptic ... ... *α. scabrida, typica.*
Leaves lanceolate-oblong to lanceolate ... *β.* var. *ligulifolia.*

Leaves not glandular-scabridulous—S. Africa. 29. *C. tabularis.*

Leaves ovate or elliptic ... ... *α. tabularis, typica.*
Leaves narrowly ovate-lanceolate to linear *β.* var. *confusa.*

Calyx longer than corolla-tube, its lobes broad, foliaceous—S. Africa. 30. *C. tetragona.*

Leaves ovate or sub-elliptic... ... ... *α. tetragona, typica.*
Leaves narrow-elliptic or lanceolate or linear ... ... *β.* var. *linearis.*

Stems decumbent or scandent, very long; leaves cordate at base; calyx not longer than corolla-tube, its lobes narrow, acute. 31. *C. melampyrifolia.*

Subgenus III.—NEOCHIRONIA. *Fruit* a 2-valved capsule, crustaceous, the valves separating completely to base and readily separating from the torus; *leaves* and *stems* scabridulous-hispid or pubescent.

Section 8.—**Neochiron.** *Calyx* 5-sect; *corolla-tube* cylindric, uniform; *anthers* straight; *ovary* obtuse, ovoid.

Leaves ovate and stems pubescent—Madagascar.
32. *C. madagascariensis.*

Internodes not longer than leaves ... ... *a. madagascariensis, typica.*
Internodes longer than leaves ... ... β. var. *pubescens.*

Leaves lanceolate and stems scabridulous-hispid—Madagascar.
33. *C. lancifolia.*

In considering the specimens in the Linnean Herbarium, it has to be recollected that in the first edition of the *Species Plantarum* (1753), pp. 189, 190, LINNAEUS enumerates seven *Chironiae*, four of which, *C. trinervia* (*Exacum*). *C. angularis* (*Sabbatia*), *C. campanulata* (*Sabbatia*), and *C. dodecandra* (*Sabbatia*), are not members of the genus as now defined, and are not African. The other three are African ; one, *C. frutescens*, is now the type of the genus *Orphium*, E. Mey. ; only two, *C. baccifera* and *C. linoides*, are now included in *Chironia*. In 1760 (*Pl. Afr. Rar.*, p. 9) Linnaeus added another species, *C. jasminoides ;* in 1771 (*Mantissa*, p. 207) he described a fourth, which he believed to be *C. lychnoides* as described by P. J. Bergius in 1767. To these the younger Linnaeus added in 1781 (*Suppl.*, p. 151) *C. nudicaulis* and *C. tetragona*. In 1756, however (*Cent.*, ii., p. 12), Linnaeus had published, as *C. caryophylloides*, a species which he subsequently included in *C. frutescens* (*Orphium frutescens*, E. Mey.) ; it is treated above as only a variety of this last species.

The register which Linnaeus kept of his specimens shows that in 1753 only one of the true *Chironiae* enumerated in the *Species Plantarum* was represented in his herbarium. This was *C. baccifera* ; the specimen named by himself is still there, accompanied by a second named by his son. The herbarium also has the specimen, named by Linnaeus himself, described as *C. lychnoides* ; this specimen represents a variety of his own *C. jasminoides*, and is not *C. lychnoides*, Berg. The specimens from which the younger Linnaeus described *C. nudicaulis* and *C. tetragona*, both named by their author, are also present ; the latter represents a valid species ; the former is only another local form of *C. jasminoides*, Linn.

There is a specimen in the Linnean Herbarium named *C. jasminoides*, but the name was not written by Linnaeus or by his son ; and the plant itself, which is a variety of *C. tetragona*, Linn. f., does not accord with the original description of *C. jasminoides*. That description is unusually full, and is so precise that, notwithstanding the considerable accession of new forms since 1760, it is still applicable to only one of the known species of *Chironia*. The plant on which the description was based was collected by Burmann ; and whilst it is true that, so far as is known, no specimen now exists on which Linnaeus himself has written the name *C. jasminoides*, there still exist specimens, collected by Burmann, of a plant to which alone the Linnean description is applicable, that have been named *C. jasminoides* by contemporaries of Linnaeus.

The absence from the Linnean Herbarium of any specimen of *C. linoides* at the time that this name was published compels us to seek elsewhere for the evidence required to establish the identity

of the species intended. This evidence is readily available, and is unequivocal. Under *C. linoides* Linnaeus gave only three citations : *Hort. Cliffort.*, p. 54, n. 1 ; *Roy. lugdb.*, 433 ; *Breyn. Cent.*, p. 175, t. 90. The specimens alluded to in the first and second citations still exist ; they are specifically identical, and belong to the well-known garden-plant whereof Breynius has supplied a figure that is remarkable for its fidelity, particularly when the date of its appearance (1678) is considered. The Linnean Herbarium now contains four specimens on two sheets, all named *C. linoides* by Linnaeus himself, but all added to the Herbarium after 1753. On the first sheet there are three specimens, two of which represent *C. linoides* as limited in the *Species Plantarum ;* the third, from its position on the sheet, was apparently attached after the other two ; it is not *C. linoides*, Linn., but is the plant that, as their original specimens show, is *C. linoides*, Thunb., not of Linn., *C. linoides*, var. *subulata*, E. Mey., *C. vulgaris*, var. *intermedia*, Cham., and *C. gracilis*, Salisb., not of Michx. We know that Linnaeus became acquainted with this plant in, or prior to, 1767, since it is to its existence that we owe the intercalation of a new character, " calycis foliola subulata," accurate as regards *C. gracilis*, but incorrect as regards *C. linoides*, which occurs in the twelfth edition of the *Systema Naturae.* The other sheet of *C. linoides* in the Linnean Herbarium has a solitary specimen which is neither *C. linoides* nor *C. gracilis ;* it is the plant that we know from their original specimens to be *C. linoides*, Berg., not of Linn., *C. uniflora*, Eckl., not of Lamk, *C. linoides*, var. *Zeyheri*, Griseb. ; *C. linoides*, var. *brevisepala*, Schoch, and *C. vulgaris*, var. *lychnoides*, Cham. This plant was fully described in 1821 by Jarosz (*Pl. Nov. Cap.*, p. 11) as *C. emarginata*, and, like *C. gracilis*, is best considered a valid species. We know that Linnaeus had not seen this plant in 1767, but that he became acquainted with it between 1767 and 1774, since it is to its existence that we owe the substitution in the thirteenth edition of the *Systema Vegetabilium* of the fresh character " calyces semi-5fidi obtusi," true as regards *C. emarginata*, but incorrect as regards both *C. linoides* and *C. gracilis*, for the equally incorrect character " calycis foliola subulata " of the twelfth edition of the *Systema Naturae.*

P. J. BERGIUS in 1767 (*Descr. Pl. Cap.*, pp. 43-47) described three species of *Chironia* from S. Africa ; *C. linoides*, *C. lychnoides* and *C. frutescens.* The last of these, as the description and citations show, is *C. frutescens*, Linn., and therefore *Orphium frutescens*, E. Mey. Thanks to the kind help of Professor V. B. Wittrock, now in charge of the Bergian collection, it has been possible to ascertain definitely what the others are. *C. linoides*, Berg., although the description given is preceded by citations that in the main refer to *C. linoides*, Linn., is not the plant so named by Linnaeus, but is the plant described as *C. emarginata* by Jarosz. *C. lychnoides*, Berg., first described by Bergius in 1767, is quite different from the plant to which Linnaeus ascribed this name in 1771, and is merely the well-known garden-plant which in 1753 Linnaeus had named *C. linoides.*

From LAMARCK'S account of *Chironia* (*Encyc. Math.*, i., pp. 736, 737) we learn that in 1783 he possessed specimens of only four true *Chironiae.* These were *C. lychnoides*, under which he noted

that the account of Linnaeus does not agree with that by Bergius, and explained that he had no authentic specimen, adding—" Nous avons dans notre Herbier une plante de ce genre que nous parôit pouvoir se rapporter à cette espèce " ; *C. linoides*, as to which he has remarked—" on en trouve une variété beaucoup plus petite " ; *C. uniflora*, proposed as a new species ; and *C. jasminoides*. The courteous assistance of Professor Lecomte has made it possible to learn what the specimens thus alluded to actually are. The sheet with the specimen of *C. lychnoides*, Lamk, not of Berg., has a label with the legend written by Lamarck, " C. lychnoides ? " ; immediately above this label is another, on which Lamarck has written " C. melampyrifolia, lam. ill." The specimen doubtfully referred to *C. lychnoides* in 1783 is thus the actual specimen on which Lamarck based his diagnosis of *C. melampyrifolia* published (*Ill. Gen.*, i., p. 479) in 1791. This species was more fully characterised by Poiret (*Encyc. Meth. Suppl.*, ii., p. 233) in 1811. It is one of the most distinct and one of the most widely spread in South Africa. It is the species which Thunberg described as *C. jasminoides* in 1804, though it is not the only plant which Thunberg issued under this name. It has besides been fully characterised on three subsequent occasions ; by Ecklon in 1830 as *C. perfoliata ;* by Meyer in 1837 as *C. speciosa ;* by Paxton in 1849 as *C. glutinosa*.

The specimen which Lamarck has named *C. linoides* occupies a special sheet ; it is the well-known garden-plant, *C. linoides*, Linn. Another sheet which bears the legend in Lamarck's handwriting—" paroit n'etre qu'une variété du Chironia linoides," has two specimens ; the smaller of these is *C. linoides*, Thunb., not of Linn. (*C. gracilis*, Salisb.) ; the larger is *C. linoides*, Berg., not of Linn. (*C. emarginata*, Jarosz).

The sheet on which Lamarck has written " Chironia uniflora. enc." has the actual specimen described (*Encyc. Meth.*, i., p. 737), and figured (*Ill. Gen.*, t. 108, f. 3) as *C. uniflora*, Lamk. This specimen represents the form of *C. tetragona*, Linn. f., described by Grisebach in 1839 as var. *brevifolia*, and is one of the two forms included by E. Meyer in 1837 in his *C. tetragona*, var. *linearis*. In 1839 and again in 1845 Grisebach has described Lamarck's figure as bad ; the figure, however, represents with fidelity the specimen from which it was drawn ; Grisebach's adverse criticism has probably been a result of the fact that he referred it to another species which, naturally, it does not well represent.

The remaining sheet in Lamarck's herbarium bears the legend " Chironia jasminoides." This legend refers to two specimens, one of which was figured by Lamarck (*Ill. Gen.*, t. 103, fig. 2) under this name. The two specimens belong to the same form ; they belong moreover to the form represented by the plant collected by Burmann, to which every botanist, prior to Thunberg, had given the name *C. jasminoides*, and they represent the only species that accords in all respects with Linnaeus's original description of *C. jasminoides*. Grisebach has suggested that Lamarck's figure represents that particular variety of the species named *C. nudicaulis*, Linn. f. This is not the case ; the specimen figured belongs to typical *C. jasminoides*, Linn. It is, however,

interesting to find that a smaller sheet, on which Lamarck has written only the word "Chironia," has a solitary specimen of the form of *C. jasminoides* which the younger Linnaeus did name *C. nudicaulis*, and that Lamarck has affixed this small carton to his original sheet of *C. jasminoides*.

THUNBERG in 1794 (*Prodr. Pl. Cap.*, i., p. 35) enumerated seven species of *Chironia* from South Africa. In 1803 he prepared a fuller account of these ; this was published (*Trans. Linn. Soc.*, vii., pp. 248–253) in 1804. The information then given was repeated in 1813 (*Flor. Cap.*, ii., pp. 107–111). The paper printed by the Linnean Society is accompanied by figures of the two species which the younger Linnaeus published (*Suppl.*, p. 151) in 1781 from specimens that Thunberg had given him. As regards these two species, *C. tetragona*, Linn. f. (*Trans. Linn. Soc.*, vii., t. 12, fig. 2) and *C. nudicaulis*, Linn. f. (*ibid.* t. 12, fig. 3) there is therefore no dubiety. Nor is there any with regard to *C. frutescens*, Thunb., which is the Linnean species so named, and therefore is *Orphium frutescens*, E. Mey. The other four species only become intelligible when the actual specimens used by Thunberg are studied ; the kind help of Professor Juel, of Upsala, has allowed of this being done.

In the Thunberg herbarium, *C. baccifera* is represented by one sheet with two specimens. These specimens differ slightly ; one represents typical *C. baccifera*, Linn. ; the other is *C. baccifera*, var. *Burchellii*. There is only one sheet marked *C. linoides* in the Thunberg herbarium ; the species represented is not *C. linoides*, Linn., but *C. gracilis*, Salisb.

The herbarium of Thunberg has four sheets named by him *C. lychnoides*. The species present on two of the sheets, α and γ, is the well-known garden-plant *C. linoides*, Linn. The sheet marked β has another species, *C. maritima*, Eckl., not of Willd. The sheet marked δ has yet another, *C. gracilis*, var. *macrocalyx*. The description given by Thunberg is rather vague, perhaps as the result of an attempt to cover three species, but it includes one character, "flowers terminal solitary," which renders it applicable only to *C. maritima*, Eckl. (sheet β), and excludes the other two. It seems, however, probable that the plant which Thunberg more particularly had in view is not *C. maritima*, but *C. linoides*, since this species has supplied half his material, and since he says of the species which he termed *C. linoides*, but which is *C. gracilis*, that it is nearly allied to, and may be no more than a variety of his *C. lychnoides*. If we could be certain as to this, then *C. lychnoides*, Thunb., is really the original *C. lychnoides*, Berg. But even so, the agreement between Thunberg and Bergius is fortuitous, for Thunberg does not cite *C. lychnoides*, Berg., as a synonym. On the contrary, he quotes *C. lychnoides*, Linn., and therefore quotes a plant that is not *C. lychnoides*, Berg., and that differs greatly from all three species to which Thunberg has applied the name *C. lychnoides*.

The plant which Thunberg described as *C. jasminoides* we know cannot be *C. jasminoides*, Linn., because the true *C. jasminoides*, as originally described by Linnaeus, has erect leaves, flowers in terminal erect dichotomous panicles with opposite subulate bracts, and a deeply divided calyx with lanceolate acuminate lobes ; whereas *C. jasminoides*, Thunb., as described by Thunberg, has

alternate divaricate branches with spreading leaves that have reflexed tips and edges, solitary flowers on terminal peduncles that are continuous with the branches, and an angular calyx with ovate acute lobes. The herbarium of Thunberg contains three sheets on which the name *C. jasminoides* has been written. That marked α has only *C. melampyrifolia*, Lamk ; this is the plant to which the description of *C. jasminoides*, Thunb., not of Linn., applies ; it is the only *Chironia* that has solitary flowers and an angular calyx and that at the same time has divaricate branches with spreading leaves that have reflexed tips and edges. The sheet marked β has only *C. tetragona*, var. *linearis*, E. Mey. ; that marked γ has again *C. tetragona*, var. *linearis*, but with this is associated another form of *C. tetragona*, Linn. f., which differs from typical *C. tetragona* in having the leaves sub-elliptic instead of ovate ; this form has been considered by E. Meyer to be referable to typical *C. tetragona* rather than to var. *linearis*. The only characters in Thunberg's description of *C. jasminoides* that are applicable to the species on his sheets β and γ are those of 'an angled calyx' and of 'solitary flowers on terminal peduncles that are continuous with the branches.' What we find therefore is that Thunberg has given a description of *C. jasminoides* which is applicable only to *C. melampyrifolia*, Lamk ; that he has associated with this species in his herbarium two forms of *C. tetragona*, Linn. f., to which his description of *C. jasminoides* is inapplicable ; that neither of the species named *C. jasminoides* by Thunberg can possibly be *C. jasminoides*, Linn. An examination of the specimens in various collections that are noted as having been issued by Thunberg shows that he rarely distributed as *C. jasminoides* the species he described under that name. The form that in most instances he gave away as *C. jasminoides* is *C. tetragona*, var. *linearis*, E. Mey., which is represented in his herbarium by sheet β ; in particular, it was this form that reached the younger Linnaeus along with the original specimens of *C. tetragona* and *C. nudicaulis*. This specimen of *C. tetragona*, var. *linearis*, is still in the Linnean Herbarium, and still misrepresents *C. jasminoides*, Linn., in that collection.

Of the sixteen species attributed by WILLDENOW to *Chironia* in 1797 (*Sp. Pl.*, i., 2, pp. 1065–1071) that are represented in his herbarium by specimens, Dr. Gilg finds that only four really belong to the genus. The courtesy of Professor Engler has afforded an opportunity of examining these specimens, which constitute nn. 4500, 4501, 4505 and 4506 of Willdenow's exsiccata. No. 4500, marked "Fleuron, W.," and named *C. jasminoides*, is *C. melampyrifolia*, Lamk, and is therefore the plant described by Thunberg as *C. jasminoides*, but is not *C. jasminoides*, Linn. ; 4501, marked "Jacquin, W.," and named *C. nudicaulis*, is not precisely *C. nudicaulis*, Linn. f., but is the plant figured by Lamarck as *C. jasminoides*, and therefore is the true *C. jasminoides*, Linn. ; 4505, marked "Wendland, W.," and named *C. linoides*, is the true *C. linoides*, Linn. ; finally 4506, marked "Hunneman, W.," and named *C. baccifera*, is the true *C. baccifera*, Linn.

When R. BROWN, in 1810 (*Prodr. Nov. Holl.*, i., 451), first placed the genus *Chironia* on a sound footing, he recognised five

legitimate and two doubtful species. The specimens at the British Museum indicate that *C. jasminoides*, R. Br., is the true *C. jasminoides*, Linn.; there are specimens in the British Museum collection so named by Solander, and so accepted by Brown. *C. lychnoides*, R. Br., may be assumed to be *C. lychnoides*, Linn., not the original *C. lychnoides*, Berg.; although there is no sheet on which Brown has written the name *C. lychnoides*, the authentic sheet of *C. lychnoides*, Linn., not of Berg., was within his reach. At the same time we know that *C. linoides*, R. Br., is the true *C. linoides*, Linn., for Brown had access to the actual plant cited by Linnaeus from *Hort. Cliffort.*, p. 54, n. 1, and it is this plant which constitutes the original *C. lychnoides*, Berg. *C. nudicaulis* and *C. tetragona*, enumerated by Brown, are the plants so named by the younger Linnaeus. Brown's *C. baccifera* is *C. baccifera*, Linn., and his *C. frutescens* is the Linnean plant so named, now known as *Orphium frutescens*, E. Mey.

Not long after the appearance of Brown's important note a species unknown in early collections found its way into European gardens, and was cultivated under the name *C. jasminoides*. An account of this plant, which is not *C. jasminoides*, Linn., and is not either of the species dealt with under *C. jasminoides* by Thunberg, appeared in 1817 (*Bot. Reg.*, iii., t. 197). In this case there is no doubt as to the plant intended; the figure supplied by EDWARDS is excellent, and the description, presumably written by Ker-Gawler, is full and accurate. Specimens of the plant occur in various contemporary collections, notably one at Kew, originally in the Herbarium of Sir W. Hooker, and one at Cambridge, originally in the Lindley Herbarium. This species agrees with both the species treated by Thunberg as *C. jasminoides* in having an angled calyx, and in having solitary flowers on terminal peduncles that are continuous with the branches. It agrees tolerably well as regards foliage with the form of *C. tetragona*, Linn. f., with sub-elliptic leaves that occurs on sheet γ of *C. jasminoides*, Thunb., in the Thunberg Herbarium, but is readily distinguished from that plant by its ovate acute in place of broad foliaceous calyx-lobes. It agrees with the plant described by Thunberg as *C. jasminoides* (Herb. Thunberg, sheet α) as regards calyx-lobes, but differs greatly in habit and foliage. It is, therefore, obviously nearly allied to both, and differs as widely as they do from the true *C. jasminoides*, Linn. The plant of the *Botanical Register* is, in fact, a species that had not previously been described, and we are indebted to an English nurseryman—Page, of Southampton—for having detected this fact and for supplying the species with a distinctive name. In Page's catalogue (*Page*, *Prodr.*, p. 121) issued in 1817 we find the name *C. tubularis* (actually printed "tabulare") used in substitution for the name *C. jasminoides*, which appears in contemporary plant-lists, and which, we know, did not indicate either *C. jasminoides*, Linn., or *C. jasminoides*, Thunb., because neither of these was then in cultivation. With the exception of Steudel, authors have treated *C. tabularis*, Page, as a *nomen nudum*, and therefore negligible. Grisebach, indeed, and—following Grisebach's example—Schoch have stated that Page's name is of doubtful incidence. This, as the evidence adduced shows, is not the case. But if this evidence had been less conclusive than it is, all doubt

as to the incidence of the name is removed by the fact that Wendland, who grew the species at Herrenhausen under the name *C. tabularis*, presented a specimen so named to E. Meyer, among whose plants it still is.

CHAMISSO and SCHLECHENDAL, in 1826, discussed cursorily the *Chironiae* from the Cape collected during the Romanzoff expedition (*Linnaea*, i., pp. 190, 191) and in 1831 Chamisso alone dealt more fully with the species sent by Ecklon from South Africa (*Linnaea*, vi., pp. 343-345). Their *C. baccifera*, only alluded to in 1826, more fully dealt with in 1831, is mainly *C. baccifera*, Linn.; one of Ecklon's gatherings is, however, *C. baccifera*, var. *Burchellii*. *C. frutescens*, dealt with in both places, is *C. frutescens*, Linn. (*Orphium frutescens*, E. Mey.). Chamisso and Schlechtendal recognised two varieties, *α hirsuta* and *β glabra*. There are two tolerably distinct varieties in this species, one with flat, often fairly broad and almost always pubescent leaves, the other with semi-terete, always narrow and usually nearly glabrous leaves. The varieties recognised by Chamisso and Schlechtendal do not quite coincide with these apparently natural varieties, for our authors have placed in their var. *hirsuta* such specimens of the narrow-leaved plant as chance to have pubescent leaves. This prevents their variety *β glabra* from corresponding precisely to *C. caryophylloides*, Linn. (*C. angustifolia*, Sims).

Chamisso dealt in 1831 with what he believed to be *C. jasminoides*, Linn., but doubted being *C. jasminoides*, Thunb. His specimens show that, like Thunberg, Chamisso included two distinct species in *C. jasminoides*; all his specimens from the Cape Division represent *C. scabrida*, var. *ligulifolia*, while all those from the Caledon Division belong to *C. tabularis*, var. *confusa*. The two species that form *C. jasminoides*, Cham., agree with the two species that form *C. jasminoides*, Thunb., in that they belong to the section *Ixochiron*, Griseb. They, therefore, both differ from the true *C. jasminoides*, Linn., which is a *Hippochiron*, as greatly as do the two plants which constitute *C. jasminoides*, Thunb. Neither of Chamisso's plants corresponds to either of the species included in *C. jasminoides*, Thunb.; one of the two plants included in *C. jasminoides*, Cham., is, however, a variety of *C. jasminoides*, Edw., not of Linn.

C. linoides, alluded to in 1826 and *C. lychnoides*, more fully dealt with then, were treated by Chamisso in 1831 as forms of one species, for which he proposed a new name, *C. vulgaris*, Cham. *C. linoides*, Cham. & Schlecht. (1826), and *C. vulgaris*, *α linoides*, Cham. (1831), are found from the specimens so named to be identical and to be the true *C. linoides*, Linn. Chamisso explained in 1831 that *C. lychnoides*, Cham. & Schlecht. (1826), included *C. vulgaris*, *β intermedia*, Cham., and *C. vulgaris*, *γ lychnoides*, Cham., of the second paper. In 1826, however, Chamisso and Schlechtendal had recognised in *C. lychnoides* three forms, not two; (1) with broad rounded submucronulate calyx-teeth, (2) with ovate acuminate calyx-teeth, (3) with narrow triangular calyx-teeth. The two varieties recognised in 1831 are *β intermedia*, with triangular calyx-lobes, sometimes rather short, sometimes elongated, and *γ lychnoides*, with short widened subauriculate calyx-lobes. The specimens show that *C. vulgaris*, *β intermedia*, Cham. (1831),

corresponds to *C. lychnoides*, Cham. & Schlecht., not of Berg. (1826) so far as the forms (2) with ovate acuminate calyx-lobes and (3) with narrow triangular calyx-lobes are concerned—(2) of 1826 being that portion of *β intermedia* of 1831 with "rather short" calyx-lobes, while (3) of 1826 is that portion of *β intermedia* with "elongated" calyx-lobes. On the other hand *C. vulgaris*, *γ lychnoides*, Cham. (1831), corresponds to *C. lychnoides*, Cham. & Schlecht., not of Berg. (1826), so far only as the form (1) with broad rounded submucronulate calyx-lobes is concerned.

In 1826 Chamisso and Schlechtendal indicated that their *C. lychnoides*, which is very unlike *C. lychnoides*, Linn., and while it includes at least two distinguishable forms, is not even in part identical with the original *C. lychnoides*, Berg., corresponds to *C. emarginata*, Jarosz, a species published in 1821 (*Pl. Nov. Cap.*, p. 11). They were, however, unable to take up this name, partly because Jarosz did not attach his determination to the specimens on which he based his description, partly because they considered all the descriptions of Jarosz to be imperfect. The description which Jarosz has given of *C. emarginata* is, however, satisfactory, and whatever may be the case as regards descriptions by Jarosz of suggested new species in other genera, the general criticism of Chamisso and Schlechtendal fails in this particular case. It has, however, to be remembered that when Jarosz proposed the recognition of his *C. emarginata*, the object he had in view was that at which Chamisso and Schlechtendal themselves were aiming, viz. :—the definite segregation from the original *C. linoides*, Linn., of the foreign elements which Linnaeus himself, in both cases at the expense of intercalating characters that exclude his original plant of 1753, had unfortunately added to *C. linoides* proper in 1767 and 1774.

An effort to attain this object, though possibly an unconscious one, was made by Bergius in 1767, when he limited the name *C. linoides* to the plant for the first time incorporated by Linnaeus in that species in 1774, and proposed for the true *C. linoides* the new name *C. lychnoides*. We have no means of judging whether Bergius intended the name *C. linoides* to be restricted to the particular plant represented in his herbarium and described in his work, because Bergius appears never to have seen the other plant included in *C. lychnoides*, Cham. & Schlecht., not of Berg. nor of Linn., which Linnaeus incorporated in *C. linoides* in 1767. We know, however, that when in 1783 Lamarck again endeavoured to effect the necessary segregation—for Lamarck's *C. linoides*, var. (variété beaucoup plus petite), is identical with *C. lychnoides*, Cham. & Schlect., not of Berg. nor of Linn.—he included both the Linnean plants that are alien to *C. linoides* in his segregate. When the attempt was repeated a third time in 1794 by Thunberg, we have seen that, although *C. lychnoides*, Thunb., is not clearly dealt with, the probability is that he intended this name to apply to the true *C. linoides*, Linn., and we know that the name *C. linoides*, Thunb., is definitely restricted to the alien form incorporated by Linnaeus in his widened *C. linoides* in 1767. But in this instance we have evidence that the limitation was fortuitous and not deliberate, because Thunberg had actually gathered, and issued as *C. linoides*, specimens of the plant which

Linnaeus did not incorporate in *C. linoides* till 1774. He therefore, like Lamarck in 1783, and like Chamisso and Schlechtendal in 1826, looked upon these two plants as conspecific, and the fact that he retained only one of them in his own herbarium was no doubt an accident.

When on further consideration Chamisso decided, in 1831, that, after all, the three plants in question might be treated as conspecific, he adopted Lamarck's treatment in so far as typical *C. linoides*, Lamk (the true *C. linoides*, Linn.), is concerned, and only went one step further than Lamarck in treating as two distinct varieties the two plants which Lamarck had treated as one variety. Chamisso apparently did not, when reconsidering the question, again refer to the description which Jarosz had provided for his *C. emarginata*. When this is done it is seen that, even if Jarosz did mean the name *C. emarginata* to cover both *C. vulgaris*, *β intermedia*, Cham., and *C. vulgaris*, *γ lychnoides*, Cham., the description itself excludes *β intermedia* and applies only to *C. vulgaris*, *γ lychnoides*, Cham.

C. nudicaulis was only alluded to in 1826. In 1831 Chamisso treated the original *C. nudicaulis*, Linn. f., as one variety (*α tabularis*) of a species to which he referred, as a second variety (*β elongata*), a plant received from the Cape as *C. elongata*, Eckl. MSS. *C. elongata* is a rather narrow-leaved form of the true *C. jasminoides*, Linn., and Chamisso was clearly right in treating this plant and *C. nudicaulis*, Linn. f., as varieties of one species. There is nothing in the text to show that in applying to *C. nudicaulis* the new epithet "tabularis," Chamisso was endeavouring to account for *C. tabularis*, Page, or indeed to suggest that Chamisso was aware of the existence of Page's name. The epithet is appropriate for *C. nudicaulis*, since this form is almost exclusively restricted to Table Mountain.

E. MEYER in 1837 (*Comm. Pl. Afr. Austr.*, ii., pp. 177–182) described the species collected in South Africa by Drège. On *C. frutescens*, Linn., he based the genus *Orphium*, so that by citation *Orphium frutescens*, E. Mey., and *C. frutescens*, Linn., are exactly synonymous. It so happens, however, that all the specimens obtained by Drège represent *C. caryophylloides*, Linn. (*C. angustifolia*, Sims), so that, as regards description, *O. frutescens*, E. Mey., is really var. *β angustifolia*, Griseb.

Two species of *Chironia* were treated by Meyer as types of another genus, *Plocandra*, E. Mey. *P. albens*, the first of these, was divided into two forms or varieties—*α* "robustior," and *β radicata*. The latter is a plant that had been described by Burchell in 1824 (*Trav.*, ii., p. 226) as *C. palustris*; the former is *C. palustris*, var. *foliata*. The other species, *P. purpurascens*, was rightly referred to *Chironia* in 1876 by Bentham and Hooker (*Gen. Pl.*, ii., p. 805).

C. arenaria, E. Mey., as described, is a species with narrow leaves and cuspidate corolla-lobes. With it Drège gathered another form with broader leaves and non-cuspidate corolla-lobes which is not covered by the description; this was distributed among Drège's plants along with *C. arenaria* proper. Schoch, who detected this

confusion in 1902, has described the second form as *C. mediocris* (*Bull. Herb. Boiss.*, ser. 2, ii., p. 1011). It is, however, only a variety, though a very distinct one, of *C. arenaria*.

The specimens named *C. baccifera* by E. Meyer represent three varieties. Those from Nieuwekloof are *C. baccifera*, Linn.; those from the Zwartkops River are var. *grandiflora*, Griseb.; those from Paarlberg are var. *Burchellii*. *C. baccifera*, var. *elongata*, E. Mey., is a long-peduncled form, but not a distinct variety, of *C. baccifera*, Linn.; var. *dilatata*, E. Mey., is however a distinct and valid variety, almost entitled to rank as a species.

C. jasminoides, E. Mey., is the species figured as *C. jasminoides* by Edwards (*Bot. Reg.*, iii., t. 197); it therefore is *C. tabularis*, Page. From a note on a specimen in Meyer's herbarium we learn that Meyer was aware that this species had been named *C. tabularis*, but that Meyer had been unable to ascertain when or by whom the name had been applied.

C. latifolia, E. Mey. (1837), is *C. peduncularis*, Lindl., *Bot. Reg.*, xxi., t. 1803 (1836).

The specimens named *C. linoides* by E. Meyer represent three species. Those from Rondebosch, from Ezelsbank and from the Kaffirkuils River belong to *C. linoides*, Linn. That from Wupperthal is a narrow-leaved form of *C. Zeyheri*, a species only known from Clanwilliam Division; that from Elands Kloof is the form of *C. vulgaris*, *β intermedia*, Cham. (*C. gracilis*, Salisb.), with rather short obtuse calyx-teeth. The form of *C. vulgaris*, *β intermedia*, Cham., with elongated calyx-teeth, has been treated by Meyer as a distinct variety of *C. linoides* (var. *subulata*, E. Mey.).

C. lychnoides, E. Mey., is not, as Meyer thought, *C. lychnoides*, Berg. (*C. linoides*, Linn.). It is not quite *C. lychnoides*, Linn. (*C. jasminoides*, var. *viminea*, Griseb.), but it is very nearly so, because it is *C. elongata*, Eckl. (the narrow-leaved form of true *C. jasminoides*, Linn.).

C. melampyrifolia, E. Mey. (1837), is not *C. melampyrifolia*, Lamk, but is a previously undescribed species, which has since been named *C. luxa*, Gilg, *Engl. Bot. Jahrb.*, xxvi., p. 105 (1898).

C. nudicaulis, E. Mey., is *C. nudicaulis*, Linn. f. (*C. jasminoides*, var. *tabularis*).

C. parvifolia, E. Mey. (1837) is *C. serpyllifolia*, Lehm., *Ind. Sem. Hort. Hamb.*, p. 16 (1828). The specimens represent two varieties, those from Van Staadesberg being var. *microphylla*, Griseb.

C. speciosa, E. Mey. (1837), is *C. melampyrifolia*, Lamk, *Ill. Gen.*, i., p. 479 (1791).

C. tetragona, as understood by E. Meyer, and his treatment cannot well be improved, includes four forms: (1) with ovate leaves (the original *C. tetragona*, Linn. f., and Thunb.); (2) with sub-elliptic leaves (a form united by Thunberg, on sheet γ of Herb. Thunb., with *C. jasminoides*, Thunb., not of Linn.); (3) with linear-lanceolate leaves (the original *C. uniflora*, Lamk); (4) with linear leaves (a form distributed by Thunberg as *C. jasminoides*, Thunb., not of Linn., and represented on sheet β and in part on

sheet γ of *C. jasminoides* in Herb. Thunb., but not covered by Thunberg's description). Forms (1) and (2) together constitute *C. tetragona*, α *ovata*, E. Mey.; forms (3) and (4) together constitute *C. tetragona*, β *linearis*, E. Mey.

GRISEBACH twice monographed the genus *Chironia*; first in 1839 (*Gen. & Sp. Gent.*, pp. 96-107), again in 1845 (*DC. Prodr.*, ix., pp. 39-41). These two accounts must be considered separately because there is no allusion in the earlier work to Meyer's paper of 1837, while there is internal evidence that it was written without knowledge of Drège's specimens or Meyer's conclusions. The later work is essentially a précis of the account by Meyer, published in 1837, and of Grisebach's own work published in 1839, with some emendations and a few references to further material. One striking feature in Grisebach's work is the paucity of the specimens which he cites under individual species. In a number of cases we learn, both from internal evidence and from the existence in various collections of specimens authentically named by Grisebach himself, that the citations under habitat are intended to be representative rather than exhaustive. At the same time he has set another pitfall for the unwary by reason of his quoting among these representative specimens plants referred to by other authors which he has intimated, by the omission of the verification symbol, that he did not himself examine. This involves the necessity, perhaps not always taken into account, for a closer study of Grisebach's *ipsissima verba* than is essential in the case of authors who adduce large suites of specimens in evidence of the characters and the validity of their species. Grisebach's descriptions, however, have been drafted with much care, and in no case are we left in doubt as to the particular form intended, even when the specimens cited are not all in accord with each other and with the diagnoses.

Chironia frutescens, Griseb. (1839), is *C. frutescens*, Linn., subdivided after the fashion adopted by Chamisso and Schlechtendal in 1826, with, however, the recognition of an additional variety γ *orthostylis*, and the alteration of the name β *glabra*, Cham. & Schlecht., to β *angustifolia*. The variety *orthostylis*, based on *C. orthostylis*, Reichb., is only a sport under cultivation of typical *C. frutescens* and cannot be sustained. But the variety β *angustifolia*, Griseb., corresponds more precisely with the limits of *C. caryophylloides*, Linn. (*C. angustifolia*, Sims), than does the variety β *glabra*, Cham. & Schlecht.; Grisebach's name is therefore to be preferred.

Chironia Krebsii, Griseb. (1839), is a valid species.

Chironia nudicaulis, Griseb. (1839), is treated after the fashion adopted by Chamisso in 1831, with the recognition of an additional variety, γ *viminea*. Grisebach's typical *C. nudicaulis* is *C. nudicaulis*, α *tabularis*, Cham., and is therefore *C. nudicaulis*, Linn. f. (*C. jasminoides*, δ *tabularis*). But *C. nudicaulis* β *elongata*, Cham., which is based on specimens from the Cape Flats and is *C. elongata*, Eckl. n. 175 (*C. jasminoides*, Linn.), was less comprehensive than *C. nudicaulis*, β *elongata*, Griseb., because Grisebach has included, along with Ecklon's n. 175, both the form of true *C. jasminoides* with broader leaves and another form

collected by Ecklon at Voormansbosch near Swellendam, which is the type of *C. nudicaulis*, δ *multiflora*, Eckl. (*C. jasminoides*, γ *multiflora*). Grisebach's *C. nudicaulis*, γ *viminea* is of especial interest because it represents *C. lychnoides*, Linn., not of Berg. (*C. jasminoides*, β *viminea*).

Chironia peduncularis, Griseb. (1839), is Lindley's species so named.

Chironia maritima, Griseb. (1839), is *C. maritima*, Eckl., published (*South Afr. Quart. Journ.*, i., p. 370) in 1830. The name may be maintained because the original *C. maritima*, Willd., happens to be an *Erythraea*.

Chironia jasminoides, Griseb. (1839), is not *C. jasminoides*, Linn., because *C. jasminoides*, Griseb., according to Grisebach's description, is an undershrub with alternate branches, solitary flowers, and a calyx in which the tube and the lobes are of about equal length ; whereas *C. jasminoides*, Linn., as described by Linnaeus, has a herbaceous stem, has its flowers in terminal erect dichotomous panicles with opposite subulate bracts, and has a 5-partite calyx. Not being *C. jasminoides*, Linn., it might be anticipated that *C. jasminoides*, Griseb., should prove to be *C. jasminoides*, Thunb., if not entirely then at least in part. Grisebach has cited, under *C. jasminoides*, as representative of his species, Thunberg's gathering from the Swellendam Division which was named by Thunberg *C. jasminoides*, but which is composed of *C. melampyrifolia* and two forms of *C. tetragona*. The only specimens, however, that Grisebach has quoted with a mark of affirmation are one collected by Krebs and one in Herb. Willdenow, both of which are *C. melampyrifolia*. He has, though doubtfully, quoted *C. melampyrifolia*, Lamk, as a synonym of his *C. jasminoides* ; he has also definitely quoted *C. uniflora*, Lamk, which is a form of *C. tetragona*, as another synonym of *C. jasminoides*, Griseb. But this evidence, which at first sight seems to show that *C. jasminoides*, Griseb., must be equivalent to *C. jasminoides*, Thunb., does not stand the test of closer scrutiny. In the first place the gathering from Swellendam in Thunberg's Herbarium, which is a mixture of three different things was not actually seen by Grisebach. In the second place the figure of *C. uniflora*, Lamk, which represents with fidelity the specimen on which Lamarck based his species, is said by Grisebach to be poor. Since it represents adequately the species that it really illustrates, Grisebach's judgment only indicates that it represents badly the plant supposed by Grisebach to be *C. jasminoides*. Further, the two species involved in *C. jasminoides*, Thunb., are accounted for independently by Grisebach ; *C. perfoliata*, Eckl., which Grisebach upholds, is *C. melampyrifolia*, Lamk ; *C. tetragona*, var. *brevifolia*, Griseb., is the actual *C. uniflora*, Lamk (*C. tetragona*, var. *linearis*, E. Mey). Finally, the description of *C. jasminoides*, Griseb., does not apply to *C. melampyrifolia*, Lamk, as regards foliage, while the account of the calyx of *C. jasminoides*, Griseb., as Grisebach himself points out, is such as to definitely exclude every form of *C. tetragona*.

These identifications of specimens of *C. melampyrifolia* with *C. jasminoides* are not the only instances to be met with ;

there is in Herb. Kew another sheet of *C. melampyrifolia* which Grisebach has himself named *C. jasminoides*; however, in this case, he has added the note :—"these specimens approach to *C. perfoliata*, Eckl." In one or two cases also, in various collections, Grisebach has, in spite of the caution he himself enjoined, attached the name *C. jasminoides* to specimens of *C. tetragona*, var. *linearis*. But Grisebach has explained that his *C. jasminoides* is nearly allied to *C. tetragona*, and Knoblauch has even suggested (*Bot. Centralbl.*, lx., p. 328) that the two may be but forms of one species.

The majority of the specimens named *C. jasminoides* by Grisebach belong, however, to a plant with which his description does agree in every respect. This plant is one that was collected by Ecklon in various localities in the Caledon Div., and that constitutes part of *C. jasminoides*, Cham., but not of Linn. nor of Thunb. ; it is a form or variety of *C. tabularis*, Page.

In addition to his typical *C. jasminoides* (*C. tabularis*, var. *confusa*), Grisebach has recognised a variety, *β lychnoides*, so named because he believed it to be *C. lychnoides*, Linn., not of Berg. The plant intended was collected by Ecklon on the Cape Flats and constitutes the remaining part of *C. jasminoides*, Cham., but not of Linn. nor of Thunb. Grisebach has, as he did under the type, quoted a gathering by Thunberg as representing his var. *lychnoides* ; he also has mentioned a plant with much longer calyx-lobes as being another form of his var. *lychnoides*. Thunberg's plant in question came from Mount Hottentots Holland and is *C. linoides*, Linn. The plant with long calyx-lobes which Grisebach has himself named *C. jasminoides*, var. *lychnoides*, came from near Cape Town, and is *C. maritima*, Eckl., not of Willd. Thunberg's plant, however, we may exclude from consideration, for Grisebach never saw it ; the specimen of *C. maritima* may also be neglected, for Grisebach has admitted that it does not quite agree with the plant he intended. The plant Grisebach had in view is a variety of his own *C. scabrida*, and is as widely different from *C. lychnoides*, Linn., as it is from the original *C. lychnoides*, Berg.

We find then, when all the circumstances are taken into account, that *C. jasminoides*, Griseb., cannot be *C. jasminoides*, Linn. We find further that *C. jasminoides*, Griseb., was not intended to coincide with *C. jasminoides*, Thunb., and that the coincidence is accidental. Finally, we find that in the case of *C. jasminoides*, as in the cases of *C. frutescens* and *C. nudicaulis*, Grisebach was attempting to adopt the species as defined by Chamisso ; since *C. jasminoides*, Griseb., as a whole, is in intention and very nearly in fact the combination of forms that composes *C. jasminoides*, Cham., not of Linn. and not of Thunb. In this instance, however, Grisebach observed that Chamisso had confused two distinct forms under *C. jasminoides*. Therefore *C. jasminoides*, Griseb., proper, is equivalent to *C. jasminoides*, Cham., so far only as the specimens from Caledon are concerned ; while *C. jasminoides*, Cham., so far as the specimens from the Cape District are concerned, has become *C. jasminoides*, *β lychnoides*, Griseb.

Chironia tetragona, Griseb. (1839), is *C. tetragona*, Linn. f. Grisebach has proposed a variety, *β brevifolia*, which is based on

specimens collected by Ecklon in the plains under the mountains of Winter Hoek, Uitenhage. These specimens represent the plant named *C. uniflora* by Lamarck; they therefore belong to *C. tetragona*, *β linearis*, E. Mey. (1837).

Chironia scabrida, Griseb. (1839), is a valid species. The solitary specimen on which the species is based is at Berlin; this form has never been collected again. The usual form or variety of this species is the plant named by Grisebach *C. jasminoides*, *β lychnoides*. It has long been known, for it is among the oldest plants at Leiden and bears there the unpublished name *C. oblusiflora*. Old specimens of the same form, now at the British Museum, bear another unpublished name, *C. ligulifolia*, Salisb.

Chironia perfoliata, Griseb. (1839), is *C. perfoliata*, Eckl., *South Afr. Quart. Journ.*, i., p. 370 (1830), and is therefore *C. melampyrifolia*, Lamk.

Chironia linoides, Griseb. (1839), is divided into two forms, a typical and a variety *β longifolia*. *C. linoides*, Griseb., is not *C. linoides*, Linn., but is exactly equivalent to *C. lychnoides*, Cham. & Schlecht., not of Berg. (1826); it therefore includes *C. gracilis*, Salisb., and *C. emarginata*, Jarosz. Grisebach knew and distinguished these two component forms, for *C. uniflora*, Eckl., not of Lamk, which he has cited, is identical with *C. emarginata*; he did not, however, think them, as Chamisso did in 1831, varietally separable. *C. linoides*, *β longifolia*, Griseb., is *C. lychnoides*, Berg., and therefore is the true *C. linoides*, Linn. In this case, therefore, as in the case of *C. frutescens*, Linn., Grisebach has adopted the treatment proposed by Chamisso and Schlechtendal in 1826, except that he has transferred the name *C. linoides*, Linn., from the plant to which it really belongs and has attributed it to the combination of forms which constitutes *C. lychnoides*, Cham. & Schlecht., not of Berg., nor of Linn.

Chironia baccifera, Griseb. (1839), is partly *C. baccifera*, Linn., partly *C. baccifera*, var. *Burchellii*; the latter he recognised as a form but not as a variety. Grisebach has recognised as a variety, *β grandiflora*, a local form from Uitenhage, quite entitled to varietal rank.

Chironia serpyllifolia, Griseb. (1839), is *C. serpyllifolia*, Lehm. *Ind. Sem. Hort. Hamb.*, p. 16 (1828). Grisebach has added two varieties *β laxa*, and *γ microphylla*; neither variety is very distinct; *β laxa* may only be a form drawn up because growing among grasses; *γ microphylla* may only be a somewhat depauperate condition due to its presence in poor soil.

In the second monograph Grisebach has accepted Meyer's genus *Orphium*, so that *Chironia frutescens*, with its variety *angustifolia* of 1839, became in 1845 *Orphium frutescens*, with a variety *β angustifolia*, Griseb.

Grisebach also accepted Meyer's genus *Plocandra* and his *P. purpurascens* (1845) is *P. purpurascens*, E. Mey. (*Chironia purpurascens*, Bth. & Hk. f.). But *P. albens*, E. Mey. (1837), has been renamed *P. palustris*, Griseb. (1845); the order of its two

forms has been reversed, so that *P. palustris*, Griseb. (*C. palustris*, Burch.), corresponds to *P. albens*, *β radicata*, E. Mey. (1837). Grisebach has, moreover, reduced *C. Krebsii*, Griseb. (1839), to *P. palustris*, Griseb. (1845); the two plants are, however, specifically separable, and Grisebach's reduction has led to the unnecessary republication of his original species as *C. densiflora* by Scott Elliot, in 1891 (*Journ. Bot.* xxix., p. 69).

Chironia nudicaulis, Griseb. (1845), has been treated as it was in 1839, except that *C. lychnoides*, E. Mey. (1837), not of Berg., has been correctly reduced to *β elongata*.

Chironia peduncularis, Griseb. (1845), has been treated as in 1839, except that *C. latifolia*, E. Mey. (1837), has been correctly reduced to this species.

Chironia maritima, Griseb. (1845), has had its natural character vitiated by the reduction here of *C. melampyrifolia*, E. Mey. (1837), not of Lamk, which is a very distinct species. Grisebach doubtfully recognised a new variety, *β ? frutescens*, Griseb. (1845); this variety is another distinct species, *C. floribunda*, Paxt., *Mag. Bot.*, xi., p. 237 (1844).

Chironia jasminoides, Griseb. (1845), was treated as in 1839, except that the alien forms cited in 1839 under *β lychnoides*, Griseb., have been excluded.

Chironia tetragona, Griseb. (1845), has been treated as in 1839 so far as the typical form is concerned. Grisebach has retained the variety *β brevifolia*, Griseb. (1839), which is the same thing as *C. uniflora*, Lamk. He has, however, at the same time recognised *C. tetragona*, var. *linearis*, E. Mey. (1837), which includes *C. uniflora*, Lamk. The limits of both varieties are further vitiated by the inclusion in *β brevifolia*, Griseb., of *C. jasminoides*, E. Mey. (1837), which is *C. tabularis*, Page, and by the reduction to *γ linearis*, E. Mey. (1837), of *C. viscosa*, Zeyh., which is the same thing as *C. jasminoides*, *β lychnoides*, Griseb. (*C. scabrida*, *β ligulifolia*).

Chironia scabrida, Griseb. (1845), has been treated as in 1839.

Chironia perfoliata, Griseb. (1845), has been treated as in 1839, except that *C. speciosa*, E. Mey. (1837), has been correctly reduced to this species.

Chironia arenaria, Griseb. (1845), as regards intention, corresponds to *C. arenaria*, E. Mey. (1837). But of the two forms distributed by Meyer as *C. arenaria*, only one was covered by the original description. The description of *C. arenaria* given by Grisebach similarly only covers one of the two forms, but in this case the form described is the one that Meyer did not describe. *C. arenaria*, Griseb., as described, is therefore not *C. arenaria*, E. Mey., but *C. arenaria*, *β mediocris*.

Chironia linoides, Griseb. (1845), has been treated as in 1839, except that an additional variety, *γ Zeyheri*, has been recognised. The plant on which this variety was based (*C. baccifera*, Zeyh., not of Linn.) represents the form which constitutes *C. uniflora*, Eckl., not of Lamk; this latter synonym Grisebach has omitted to transfer from *C. linoides*, Griseb., not of Linn., to his new variety *γ Zeyheri*, Griseb. Except for this omission the treatment

of *C. linoides*, Griseb. (1845), is identical, so far as the plants are concerned, with that adopted by Chamisso in 1831, for *C. linoides*, Griseb. (*C. gracilis*, Salisb.), is *C. vulgaris*, *β intermedia*, Cham.; var. *β longifolia*, Griseb. (*C. linoides*, Linn.), is *C. vulgaris*, *α linoides*, Cham.; var. *γ Zeyheri*, Griseb. (*C. emarginata*, Jarosz), is *C. vulgaris*, *γ lychnoides*, Cham.

Chironia baccifera, Griseb. (1845), has been treated as in 1839, except that var. *β elongata*, E. Mey. (1837), has been correctly reduced to *C. baccifera*, Linn., and var. *γ dilatata*, E. Mey. (1837), has been correctly recognised as a distinct variety.

Chironia serpyllifolia, Griseb. (1845), has been treated as in 1839, except that *C. serpyllifolia*, Eckl. (1830), has been correctly reduced to var. *γ microphylla*, Griseb., and that *C. parvifolia*, E. Mey. (1837), has been also reduced here; in this instance not quite correctly, because only Drège's Van Staadesberg gathering belongs to this variety.

SCHOCH in his monograph of *Chironia*, published in 1903 (*Bot. Centralbl. Beih.*, xiv., pp. 175–242), has described so carefully the various forms recognised, and has quoted specimens so fully in support of his conclusions that it is unnecessary to do more here than refer briefly to the points as to which these conclusions do not coincide with the results arrived at in the course of the present study. In not a few instances the discrepancies between Schoch's conclusions and those now stated amount to no more than a difference of opinion as regards the limitation of particular species or varieties. It will, however, be found that the authorities quoted by Schoch under individual species have been cited on bibliographical principles rather than as the result of a study of the specimens dealt with by the authors themselves; this circumstance somewhat lessens the utility of his citations for taxonomic purposes.

Chironia baccifera, Schoch (1903), includes *C. baccifera*, Linn.,* and *C. baccifera*, var. *grandiflora*, Griseb. Only one variety, *β dilatata*, Schoch, has been recognised; this variety is not identical with *β dilatata*, E. Mey., since it also includes *C. baccifera*, var. *Burchellii*, a form referred by other authors to *C. baccifera*, Linn., proper.

Chironia serpyllifolia, Schoch (1903), has not been treated precisely as it was by Grisebach, since Schoch has only admitted two forms, corresponding to *β laxa*, Griseb., and *γ microphylla*, Griseb. It is left doubtful which of these may be the original *C. serpyllifolia*.

Chironia pubescens, Schoch (1903), is *C. pubescens*, Bak. (1882), which does not, however, appear to be specifically separable from *C. madagascariensis*, Bak. (1881).

Chironia jasminoides, Schoch (1903), is recognised on bibliographical in preference to morphological considerations. Among the specimens cited, Ecklon n. 176 is *C. scabrida*, var. *ligulifolia* (Grisebach's *C. jasminoides*, var. *lychnoides*); the two MacOwan

* One of the earliest references to this species is that in *Mus. Petiv.*, cent. iv. and v., p. 37, nn. 366, 367; one specimen does duty for both numbers in Herb. Sloane, vol. 156.

specimens—from Durban Road, near Cape Town, not from Natal—are the same. The Muizenberg specimen is *C. maritima*, Eckl. The Lowry's Pass specimen is *C. tabularis* (Meyer's *C. jasminoides*). Schlechter n. 9393 is *C. tabularis*, var. *confusa* (Grisebach's described *C. jasminoides* and the Caledon part of *C. jasminoides*, Cham.). The Knysna and Plettenberg Bay plant is *C. melampyrifolia*, Lamk (the plant described as *C. jasminoides* by Thunberg); so, too, is Rust n. 314 from Riversdale. Schoch has made a conscientious and very nearly successful attempt to include, under his *C. jasminoides*, every form to which the name had been applied by Thunberg, Meyer, Chamisso, and Grisebach; at the same time he has expressly excluded *C. jasminoides*, Lamk, which alone happens to be also the true *C. jasminoides*, Linn.

Chironia tetragona, Schoch (1903), has been treated more nearly as it was treated by Grisebach in 1845 than as it was by Meyer in 1837 or by Grisebach in 1839. Three varieties have been recognised: (1) var. *ovata*, Schoch, narrowed as compared with var. *ovata*, E. Mey. (1837), by the exclusion of all specimens except those with ovate leaves; (2) var. *linearis*, Schoch, which is practically identical with var. *linearis*, Griseb. (1845), and is therefore narrowed as compared with the original var. *linearis*, E. Mey. (1837), by the exclusion of *C. tetragona*, var. *brevifolia*, Griseb. (1839), and of *C. uniflora*, Lamk. (1783). All specimens intermediate between these restricted varieties, *ovata* and *linearis*, have been treated by Schoch as his (3) typical *C. tetragona*. While it seems, on the whole, preferable to adopt the treatment proposed by E. Meyer in 1837, under which only two varieties are recognised in *C. tetragona*, there is something to be said in favour of the method proposed by Grisebach in 1845, and amended by Schoch in 1903, under which three varieties are recognised. It has, however, to be noted that *C. viscosa*, Zeyh., which Grisebach placed in var. *linearis*, but which Schoch has transferred to his typical *C. tetragona*, does not belong to this species; it is a form of *C. scabrida*. Among the specimens cited by Schoch, it has further to be remarked that Schlechter n. 9614 is not *C. tetragona*, Linn. f., but *C. tabularis*, Page; also that Bolus n. 4182 is not *C. tetragona*, var. *linearis*, E. Mey., but *C. tabularis*, var. *confusa*. Finally, it has to be noted that the incidence of the name *C. tetragona*, Schoch, is erroneous; it is the form which Schoch terms *C. tetragona*, var. *ovata*, that alone constitutes the original *C. tetragona*, Linn. f.; if the recognition of three rather than of two varieties be accepted, the correct appellation of what Schoch has considered to be typical *C. tetragona* is *C. tetragona*, var. *brevifolia*, Griseb.

Chironia Schinzii, Schoch (1903) is a valid species.

Chironia nudicaulis, Schoch (1903), is partly *C. nudicaulis*, Linn. f. (*C. jasminoides*, *ĉ tabularis*), but is mainly *C. jasminoides*, Linn., proper. The variety *γ viminea*, established by Grisebach in 1839, has been transferred by Schoch to *C. lychnoides*.

Chironia linoides, Schoch (1903), has been divided into three forms: (1) *C. linoides* proper; (2) var. *subulata*, Schoch; (3) var. *brevisepala*, Schoch. As a whole, *C. linoides*, Schoch, is precisely equivalent to *C. lychnoides*, Cham. & Schlecht., not of Berg.,

while the three forms more or less correspond to the three forms recognised by Chamisso and Schlechtendal in 1826, and *C. linoides*, Schoch, therefore definitely excludes *C. linoides*, Linn., except in so far as the citation *Hort. Cliff.*, p. 54, is concerned; the plant thus cited belongs to the species which Schoch has himself named *C. Ecklonii*. The specimens quoted by Schoch under *C. linoides* proper belong mainly to *C. gracilis*, Salisb.; a few, however, *e.g.*, Wolley Dod n. 351, belong to *C. emarginata*, Jarosz; one, collected by Drège, at Wupperthal, in Caledon Div., belongs to *C. Zeyheri*, var. *augustifolia*. Schoch's var. *subulata* is var. *subulata*, E. Mey. (1837), and therefore is *C. gracilis*, Salisb. Schoch's var. *brevisepala* is the plant which Grisebach had separated as var. *Zeyheri* (1845); consequently Schoch's varietal name, *brevisepala*, has in any case to be suppressed, and his citation of var. *Zeyheri* has to be transferred from var. *subulata* to the form termed by him var. *brevisepala*. The synonym *C. uniflora*, Eckl., not of Lamk, cited under *C. linoides*, Schoch, proper, has also to be transferred to his var. *brevisepala*.

Chironia scabrida, Schoch (1903), is *C. scabrida*, Griseb. (1839).

Chironia perfoliata, Schoch (1903), is *C. melampyrifolia*, Lamk (1791).

Chironia mediocris, Schoch (1903), is a variety of *C. arenaria*, E. Mey. (1837).

Chironia melampyrifolia, Schoch (1903), is *C. laxa*, Gilg (1898); it is *C. melampyrifolia*, E. Mey. (1837), not of Lamk.

Chironia lychnoides, Schoch (1903), is partly *C. lychnoides*, Linn. (*C. jasminoides*, γ *viminea*), and partly *C. elongata*, Eckl. (the narrow-leaved form of typical *C. jasminoides*, Linn., which is also *C. lychnoides*, E. Mey.). It is not, even in part, the true *C. lychnoides*, Berg.

Chironia lancifolia, Schoch (1903), is *C. lancifolia*, Bak. (1890).

Chironia Ecklonii, Schoch (1903), is *C. linoides*, Linn. Schoch has for the first time definitely shown that this species, which corresponds to *C. linoides*, β *longifolia*, Griseb., is entitled to specific rank, and that the supposed intermediate forms between this species and the two species, *C. gracilis* and *C. emarginata*, which together constitute *C. linoides*, Schoch, not of Linn., do not exist. Owing, however, to his employment of the name *C. linoides* for the forms which Linnaeus did not add to his original species till 1767 and 1774, Schoch has been led to propose an unfamiliar name for what is the true *C. linoides*, Linn. Even if Schoch had been right in transferring the name *C. linoides* from the plant to which alone Linnaeus applied it in 1753, the name *C. Ecklonii* was unnecessary; in the first place, this species has been known in plant-lists since 1893 as *C. ixifera*; in the second place, this is the plant described in 1767 as *C. lychnoides*, Berg.

Chironia arenaria, Schoch (1903), is *C. arenaria* as described by E. Meyer in 1837; it is not, however, the plant described as *C. arenaria* by Grisebach in 1839. Grisebach's *C. arenaria*, as described, is *C. mediocris*, Schoch.

Chironia Schlechteri, Schoch (1903), is *C. laxa*, Gilg (1898).

Chironia Fischeri, Schoch (1903), is *C. floribunda*, Paxt. (1844). The two names were first published together, but the name *C. floribunda* was given precedence.

Chironia maritima, Schoch (1903), is *C. maritima*, Eckl., not of Willd.

Chironia Tysonii, Schoch (1903), is *C. Tysonii*, Gilg (1898). This form is, however, only varietally separable from *C. purpurascens*, Benth. & Hook. f., and the Natal specimens cited by Schoch do not belong to the variety. *C. Tysonii* was based by Gilg on Bolus n. 1290, the specimen of which, at Berlin, is described by Gilg as having all save the primary flowers of its cymes 4-merous; this is not the case with Bolus n. 1290 in Herb. Bolus or in Herb. Kew. Further, Bolus n. 1290 is the same gathering as Tyson n. 2113, and some specimens of this gathering agree exactly with *C. Bachmannii* even as regards foliage, while others agree exactly with *C. purpurascens* proper.

Chironia Bachmannii, Schoch (1903), is *C. Bachmannii*, Gilg (1898). This form, though recognisable, is not however separable, even as a variety, from *C. purpurascens*, Benth. & Hook. f.

Chironia purpurascens, Schoch (1903), so far as the specimens from Griqualand and Natal are concerned, is *C. purpurascens*, Benth. & Hook. f. (1876). But the Matabeleland gathering cited represents *C. humilis*, Gilg, var. *Wilmsii*; the specimens obtained by Whyte in Pondowe, and by Nutt in Fwambo, are *C. laxiflora*, Bak.

Chironia maxima, Schoch (1903), is *C. rosacea*, Gilg (1898).

Chironia latifolia, Schoch (1903), is *C. peduncularis*, Lindl. (1836). It is *C. latifolia*, E. Mey. (1837), not of Donn, as Schoch has said, but Meyer's name was not published, as Schoch has imagined, in 1835.

Chironia erythraeodes, Schoch (1903), is *C. erythraeodes*, Hiern (1898).

Chironia laxiflora, Schoch (1903), is *C. laxiflora*, Bak. (1894).

Chironia densiflora, Schoch (1903), is *C. Krebsii*, Griseb. (1839).

Chironia rubro-coerulea, Schoch (1903), is *C. laxiflora*, Bak. (1894).

Chironia transvaalensis, Schoch (1903), is *C. transvaalensis*, Gilg (1898).

Chironia angolensis, Schoch (1903), is *C. angolensis*, Gilg (1898), so far as the specimens from Tropical Africa are concerned. But Wood n. 1154, from Natal, is typical *C. purpurascens*, Benth. & Hook. f.

Chironia rosacea, Schoch (1903), is *C. rosacea*, Gilg (1898), so far as the Natal specimens cited by Schoch are concerned. The Tropical African specimen cited does not belong to the species, or even to the section.

Chironia humilis, Schoch (1903), is partly *C. humilis*, Gilg (1898), partly *C. Wilmsii*, Gilg (1898), which latter form may be treated as a variety of *C. humilis*.

Chironia Wilmsii, Schoch (1903), is wholly *C. Wilmsii*, Gilg (*C. humilis*, var. *Wilmsii*).

Chironia Baumiana, Schoch (1903), is *C. Baumiana*, Gilg (1903).

Chironia palustris, Schoch (1903), taken as a whole, is *C. palustris*, Burch. Schoch has, however, recognised two varieties—(1) *C. palustris* proper; (2) var. *radicata*. As to this Schoch was justified; he has, however, as in the cases of *C. tetragona* and of *C. linoides*, inverted the incidence of the names; *C. palustris*, var. *radicata*, Schoch, is true *C. palustris*, Burch., while the plant which Schoch has termed *C. palustris* is *C. palustris*, var. *foliata*.

For facility of reference a table of the synonymy of *Chironia* is appended. Three of the synonyms given are doubtful, viz.:—*C. cymosa*, *C. tenuiflora* and *C. dianthiflora*.

Chironia cymosa, Burm. f., *Prodr. Pl. Cap.*, p. 5 (1768), is based on Plukenet, *Mantissa*, 89, pl. 6; t. 415, fig. 6 (1700). The specimen, given by Stonestreet, on which the drawing was based, is not now in the Plukenet Herbarium. We can therefore deal only with the drawing. The leaves are shown as penninerved, so that if this character be correct, the plant cannot be a *Chironia*. But we know that other figures of later date than Plukenet's plate, of *Chironia* and *Orphium*, where the venation is palmate, exhibit the same discrepancy; it may, therefore, be neglected. The facies of the plant represented in the figure is shared by only two species of *Chironia* from South Africa, viz.: *C.* (Hippochiron) *jasminoides*, Linn., and *C.* (Plocandra) *purpurascens*, Benth. & Hook. f. The drawing lays stress on the presence of subulate bracts, a feature that excludes *C. purpurascens*, which was, moreover, not known in the seventeenth century. This feature is in keeping with the characters that mark *C. jasminoides*. There is, however, another discrepancy in the drawing, as compared with *C. jasminoides*; the calyx-lobes in the drawing are considerably shorter than the corolla-tube. *C. jasminoides* was known about the time that Plukenet's figure was published, for there is a specimen of typical *C. jasminoides* in Sloane's Herbarium, vol. 156, fol. 158, collected by Oldenland, which was accounted for by Ray in 1704 (*Suppl. Append.*, p. 243; *Petiv.*, n. 29), as *Centaurium* capense *elatius Pneumonanthen folio*; therefore, though the difference between the drawing and the plant compels us to consider *C. cymosa*, Burm. f., a doubtful synonym, the probability is that *C. jasminoides* is the species intended. If this be so, the shape of the leaves and the number of the flowers indicate that the particular form intended by the figure is *C. jasminoides* γ *multiflora*.

Chironia tenuiflora, Link *ex* Steud., *Nomencl.*, ed. 2, i. p. 352 (1840) is a name that has not been met with on any specimen in the various collections examined. In some collections, however, there are specimens of that form of *C. gracilis*, Salisb., in which the calyx-lobes are short and rather wide, which were collected by Ecklon, and were in the first instance named by him *C. uniflora*, Lamk. Having discovered his error, Ecklon re-named these specimens *C. tenuifolia*. In his distribution Ecklon has consistently used

the name *C. lychnoïdes* or *C. lychnoidea* (he employed both spellings) for *C. linoides*, Linn., and equally consistently used the name *C. linoides* for *C. linoides β subulata*, E. Mey., which is that portion of *C. gracilis* in which the calyx-lobes are narrow and elongated. *C. uniflora*, Eckl., not of Lamk, on sheets issued with printed labels, is the name consistently used by Ecklon for *C. emarginata*; the name *C. tenuifolia* for the form of *C. gracilis* with shorter calyx-lobes was not issued on Ecklon's printed tickets. It is not impossible that this name *C. tenuifolia*, Eckl., may have been misread by Link for *C. tenuiflora*, and may explain the existence of this citation by Steudel. The suggestion is, however, conjectural, and until a specimen named by Link is met with, the synonym must remain doubtful. It may be remarked in connection with this that in Herb. Oxford there is a specimen named by Steudel himself which is of interest as showing (1) that Steudel was among those who appreciated that *C. linoides*, Eckl., not of Linn. (*C. gracilis*), and *C. uniflora*, Eckl., not of Lamk (*C. emarginata*), are, as Ecklon in the field believed them, distinct species; and (2) that Steudel had observed that *C. uniflora*, Eckl., is not the original *C. uniflora*, Lamk, for he has substituted *C. obtusa*, Steud., for Ecklon's name *C. uniflora*. It may also be remarked that the word *tenuifolia* as a varietal name was used both by Harvey and by Prior in connection with *C. baccifera*. Their *C. baccifera* was *C. baccifera*, var. *Burchellii*; to distinguish between this and the form that constitutes the original *C. baccifera* of Linnaeus, they used for the latter the name *C. baccifera*, var. *tenuifolia*.

Chironia dianthiflora, Hort., is a name that apparently only occurs once (*Garden* for 1893, p. 213) in company with names of several other species of *Chironia*, all of which can be accounted for as being then in cultivation. As the other species mentioned exhaust the list of the then cultivated *Chironiae*, the name *C. dianthiflora* should, by exclusion, apply to *Orphium frutescens*, for which species this garden synonym is not inappropriate. There must, however, remain an element of doubt, owing to the absence of any specimen of the plant to which the name was applied.

CHIRONIA, Linn. (1737) emend. R. Br. (1810).

amoena, Salisb. Prodr. 137 (1796) = linoides.
angolensis, *Gilg in Engl. Bot. Jahrb.* xxvi. 104 (1898) Afr. trop.
angolensis, Schoch in Bot. Centralbl. Beih. xiv. 228 (1903) = angolensis; purpurascens.
angustifolia, Sims Bot. Mag. t. 818 (1805) = Orphium frutescens, β.
arenaria, *E. Mey. Comm. Pl. Afr. Austr.* ii. 180 (1837) Afr. austr.
arenaria, Griseb. in DC. Prodr. ix. 40 (1845) = arenaria, β.
baccata, Hoffmgg Verzeichn. Pfl. Nachtr. 211 (1824) = baccifera.
baccifera, *Linn. Sp. Pl.* 190 (1753) Afr. austr.
baccifera, Zeyh. ex Griseb. in DC. Prodr. ix. 41 (1845) = emarginata.

Bachmannii, Gilg in Engl. Bot. Jahrb. xxvi. 103 (1898) = purpurascens.
Bansei, *Prain in Kew Bull.* 1908, 295 (1908) in hortis tantum.
Barclayana, Hort. Berol. ex Griseb. Gen. & Sp. Gent. 100 (1839) = peduncularis.
Baumiana, *Gilg in Warb. Kunene-Sambesi Exped.* 334 (1903) Afr. trop.
caryophylloides, Linn. Cent. ii. 12 (1756) = Orphium frutescens, β.
cymosa, Burm. f. Fl. Cap. Prodr. 5 (1768) = jasminoides, γ; forsan.
decussata, Vent. Hort. Cels t. 31 (1800) = Orphium frutescens.
densiflora, Scott Elliot in Journ. Bot. xxix, 69 (1891) = Krebsii.
dianthiflora, Hort. ex Garden xliv. 213 (1893) = Orphium frutescens; forsan.
Ecklonii, Schoch in Bull. Herb. Boiss. ser. 2, ii. 1013 (1902) = linoides.
elongata, Eckl. Un. It. n. 175 (s. d.) = jasminoides.
emarginata, *Jarosz Pl. Nov. Cap.* 11 (1821) Afr. austr.
erythraeodes, *Hiern in Cat. Welw. Afr. Pl.* i. 709 (1900) Afr. trop.
exigua, Oliv. in Hook. Ic. Pl. t. 1229 (1877) = Sebaea exigua.
Fischeri, Hort. Rollins. ex Paxt. Mag. Bot. xi. 237 (1844) = floribunda.
flexuosa, *Bak. ex Prain in Kew Bull.* 1908, 296 (1908) Afr. trop.
floribunda, *Paxt. Mag. Bot.* xi. 237 (1844) in hortis tantum.
frutescens, Linn. Sp. Pl. 190 (1753) = Orphium frutescens.
fruticosa, Kuntze Rev. Gen. 432 (1891) = Orphium frutescens.
glutinosa, Paxt. Mag. Bot. xv. 245 (1849) = melampyrifolia.
gracilis, *Salisb. ex Prain in Kew Bull.* 1908, 293 (1908) Afr. austr.
grandiflora, Salisb. Prodr. 137 (1796) = Orphium frutescens.
humilis, *Gilg in Engl. Bot. Jahrb.* xxvi. 105 (1898) Afr. trop.; Afr. austr.
humilis, Bak. & Br. in Dyer Fl. Trop. Afr. iv. 1, 555 (1903) = humilis, β.
ixifera, Hort. ex Garden xliv. 213 (1893) = linoides.
jasminoides, *Linn. Pl. Afr. Rar.* 9 (1760) Afr. austr.
jasminoides, Thunb. Prodr. Pl. Cap, i. 35 (1794) = melampyrifolia; tetragona, β; tetragona.
jasminoides, Willd. Sp. Pl. i. 2, 1066 (1797) = tetragona, β.
jasminoides, Edw. Bot. Reg. iii. t. 197 (1817) = tabularis.
jasminoides, Burch. Trav. i. 46 (1821) = jasminoides, δ.
jasminoides, Cham. in Linnaea vi. 344 (1831) = scabrida, β; tabularis, β.
jasminoides, Griseb. Gen. & Sp. Gent. 101 (1839) = melampyrifolia; tabularis, β; tetragona, β.
jasminoides, Schoch in Bot. Centralbl. Beih. xiv. 194 (1903) = scabrida, β; maritima; tabularis, α & β; melampyrifolia.
jasminoides, β, Banks ex Edw. Bot. Reg. iii. sub t. 197 (1817) = scabrida, β.

Krebsii, *Griseb. Gen. & Sp. Gent.* 102 (1839) Afr. austr.
lancifolia, *Bak. in Journ. Linn. Soc.* xxv. 334 (1890) Madagascar.
latifolia, Donn Hort. Cantab. ed. 2, 25 (1800) = Orphium frutescens.
latifolia, E. Mey. Comm. Pl. Afr. Austr. ii. 178 (1837) = peduncularis.
laxa, *Gilg in Engl. Bot. Jahrb.* xxvi. 105 (1898) Afr. austr.
laxiflora, *Bak. in Kew Bull.* 1894, 25 (1894) Afr. trop.
ligulifolia, Salisb. MSS. in Herb. Mus. Brit. (s. d.) = scabrida, β.
linoides, *Linn. Sp. Pl.* 189 (1753) Afr. austr.
linoides, Berg. Descr. Pl. Cap. 43 (1767) = emarginata.
linoides, Thunb. Prodr. Pl. Cap. 35 (1794) = gracilis.
linoides, E. Mey. Comm. Pl. Afr. Austr. ii. 179 (1837) = linoides ; gracilis ; Zeyheri, β.
linoides, Griseb. Gen. & Sp. Gent. 104 (1839) = gracilis ; emarginata.
linoides, Eckl. Un. It. n. 40 (s. d.) = gracilis.
linoides, Schoch, in Bot. Centralbl. Beih. xiv. 202 = gracilis ; emarginata ; Zeyheri, β.
linoides, β, Lamk Encyc. Meth. i. 736 (1783) = gracilis ; emarginata.
linoides, β, E. Mey. Comm. Pl. Afr. Austr. ii. 180 (1837) = gracilis.
linoides, β, Griseb. Gen. & Sp. Gent. 104 (1839) = linoides.
linoides, γ, Griseb. in DC. Prodr. ix. 41 (1845) = emarginata.
lychnoidea, Eckl. Un. It. n. 64 (s. d.) = linoides.
lychnoides, Berg. Descr. Pl. Cap. 45 (1767) = linoides.
lychnoides, Linn. Mantiss. 207 (1771) = jasminoides, β.
lychnoides, Lamk Encyc. Meth. i. 736 (1783) = melampyrifolia.
lychnoides, Thunb. Prodr. Pl. Cap. 35 (1794) = linoides ; maritima ; gracilis, β.
lychnoides, Cham. & Schlecht. in Linnaea i. 190 (1826) = emarginata ; gracilis.
lychnoides, E. Mey. Comm. Pl. Afr. Austr. ii. 177 (1837) = jasminoides.
lychnoides, Schoch in Bot. Centralbl. Beih. xiv. 209 (1903) = jasminoides, α & β.
madagascariensis, *Bak. in Journ. Linn. Soc.* xviii. 273 (1881) Madagascar.
maritima, *Eckl. non Willd. South Afr. Quart. Journ.* i. 370 (1830) Afr. austr.
maritima, Griseb. in DC. Prodr. ix. 39 (1845) = maritima ; laxa.
maritima, β, Griseb. in DC. Prodr. ix. 39 (1845) = floribunda.
maxima, Schoch in Bull. Herb. Boiss. ser. 2, ii. 1014 (1902) = rosacea.
mediocris, Schoch in Bull. Herb. Boiss. ser. 2, ii. 1011 (1902) = arenaria, β.
melampyrifolia, *Lamk. Ill. Gen.* 479 (1791) Afr. austr.
melampyrifolia, E. Mey. Comm. Pl. Afr. Austr. ii. 177 (1837) = laxa.
nudicaulis, Linn. f. Suppl. 151 (1781) = jasminoides, δ.

nudicaulis, β, Eckl. ex Cham. in Linnaea vi. 344 (1831) = jasminoides.
nudicaulis, γ, Griseb. Gen. & Sp. Gent. 99 (1839) = jasminoides, β.
nudicaulis, δ, Eckl. ex Schoch in Bot. Centralbl. Beih. xiv. 210 (1903) = jasminoides, γ.
obtusa, Steud. MSS. in Herb. Oxon. (s. d.) = emarginata.
obtusiflora, Herb. Lugd. Bat. (s. d.) = scabrida, β.
orthostylis, Reichb. Ic. Bot. Exot. 16. t. 245 (1830) = Orphium frutescens.
ovata, Spreng. ex Griseb. in DC. Prodr. ix. 41 (1845) = serpyllifolia.
palustris, *Burch. Trav.* ii. 226 (1824) Afr. austr.
palustris, Hook. f. in Bot. Mag. t. 7101 (1890) = palustris, β.
palustris, Gilg in Warb. Kunene-Sambesi Exped. 334 (1903) = transvaalensis.
parviflora, Salisb. Prodr. 136 (1796) = baccifera.
parvifolia, E. Mey. Comm. Pl. Afr. Austr. ii. 180 (1837) = serpyllifolia.
peduncularis, *Lindl. Bot. Reg.* t. 1803 (1836) Afr. austr.
Peglerae, *Prain in Kew Bull.* 1908, 297 (1908) Afr. austr.
perfoliata, Eckl. in South Afr. Quart. Journ. i. 370 (1830) = melampyrifolia.
pubescens, Bak. in Journ. Bot. xx. 172 (1882) = madagascariensis, β.
purpurascens, *Benth. & Hook. f. Gen. Pl.* ii. 805 (1876) Afr. austr.
purpurascens, Rolfe in Oates, Matabeleland, ed. 2, 404 (1889) = humilis, β.
purpurascens, Schoch in Bot. Centralbl. Beih. xiv. 219 (1903) = purpurascens ; humilis, β ; laxiflora.
rosacea, *Gilg in Engl. Bot. Jahrb.* xxvi. 104 (1898) Afr. austr.
rosacea, Schoch in Bot. Centralbl. Beih. xiv. 229 (1903) = rosacea ; angolensis.
rubro-coerulea, Gilg in Engl. Bot. Jahrb. xxx. 379 (1901) = laxiflora.
scabra, Krauss MSS. (s. d.) = scabrida, β.
scabrida, *Griseb. Gen. & Sp. Gent.* 103 (1839) Afr. austr.
Schinzii, *Schoch in Bull. Herb. Boiss.* ser. 2, ii. 1010 (1902) Afr. austr.
Schlechteri, Schoch in Bull. Herb. Boiss. ser. 2, ii. 1010 (1902) = laxa.
serpyllifolia, *Lehm. Ind. Sem. Hort. Hamb.* 1828, 16 (1828) Afr. austr.
serpyllifolia, Eckl. in South Afr. Quart. Journ. i. 371 (1830) = serpyllifolia, γ.
speciosa, E. Mey. Comm. Pl. Afr. Austr. ii. 178 (1837) = melampyrifolia. Afr. austr.
tabularis, *Page Prodr.* 121 (1817)
tenuiflora, Link ex Steud. Nomencl. ed. 2, i. 352 (1840) = gracilis ; forsan.
tenuifolia, Eckl. MSS. (s. d.) = gracilis. Afr. austr.
tetragona, *Linn. f. Suppl.* 151 (1781)

tetragona, Schoch in Bot. Centralbl. Beih. xiv. 196 (1903) = tetragona, β.
tetragona, β, Griseb. in DC. Prodr. ix. 40 (1845) = tetragona, β ; tabularis.
tetragona, β, Schoch in Bot. Centralbl. Beih. xiv. 197 (1903) = tetragona.
tetragona, γ, Griseb. in DC. Prodr. ix. 40 (1845) = tetragona, β ; scabrida, β.
transvaalensis, *Gilg in Engl. Bot. Jahrb.* xxvi. 104 (1898) Afr. trop. ; Afr. austr.
trinervia, Hort. ex Ann. Fl. & Pom., 158 (1834) = peduncularis.
trinervis, Hort. ex Loud. Encyc. Pl. Suppl. ii. 1306 (1830) = peduncularis.
Tysonii, Gilg in Engl. Bot. Jahrb. xxvi. 104 (1898) = purpurascens, β.
uniflora, Lamk Encyc. Meth. i. 737 (1783) = tetragona, β.
uniflora, Eckl. Un. It. n. 75 (s. d.) = emarginata.
Verdickii, *De Wildem. Études Fl. Congo*, ii. 3, 338 (1908) Afr. trop.
virgularis, Salisb. MSS. (s. d.) = emarginata.
viscosa, Zeyh. ex Griseb. in DC. Prodr. ix. 40 (1845) = scabrida, β.
vulgaris, α, Cham. in Linnaea vi. 343 (1831) = linoides.
vulgaris, β, Cham. in Linnaea vi. 343 (1831) = gracilis.
vulgaris, γ, Cham. in Linnaea vi. 343 (1831) = emarginata.
Wilmsii, Gilg in Engl. Bot. Jahrb. xxvi. 105 (1898) = humilis, β.
Zeyheri, *Prain in Kew Bull.* 1908, 295 (1908) Afr. Austr.

D. Prain.

XLVI.—MISCELLANEOUS NOTES.

Mr. Alexander Hislop, formerly a member of the gardening staff of the Royal Botanic Gardens, and afterwards successively Assistant Superintendent of the Municipal Gardens, Queenstown, Cape Colony, and Curator of the Pietermaritzburg Botanic Society's Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, Curator in the Agricultural Department of Southern Nigeria.

Kew Bulletin : Additional Series, VIII.—As already recorded in the *Kew Bulletin* for 1906, p. 276, the late Mr. C. B. Clarke, who gave the greater part of his time during nearly twenty years of his life to a critical study of the natural order *Cyperaceae*, became by degrees the recognised authority on this family, to whom botanists of every nationality sent their collections from all parts of the world for identification. The work Mr. Clarke had in view was the preparation of a monograph of the family. This monograph, though complete so far as references to material submitted to him for study are concerned, was still unpublished when he died. For reasons explained in the preface to the work under

review, the complete issue of the manuscript was found to be impracticable. At the same time it was found that a few of the genera and a considerable number of the species described in Mr. Clarke's manuscript had never been published. The specimens in the Herbarium at Kew which represent these unpublished species are authentically named by Mr. Clarke ; other herbaria contain specimens of at least some of these species, also authentically named by him. The names attached being, however, *nomina nuda*, are not readily available for use in the routine work of botanical determination, and, although in time doubtless the various names employed by Mr. Clarke might be expected to be taken up and provided with diagnoses by other workers, it seemed advisable, since the issue of the whole of the manuscript was not immediately practicable, to render generally available the actual descriptions given by their author of these unpublished species. The work of editing these descriptions has been undertaken by Mr. B. Daydon Jackson, who has bestowed on it all the pains that characterise his labours and all the solicitude that might have been anticipated on the part of a warm personal friend of the lamented author.

In presenting the diagnoses of these new genera and species, the scheme of arrangement followed has been that devised by the late Mr. Clarke so far as material for it exists in the manuscript. To make the scheme more intelligible, it has been appended in skeleton form to the descriptions now published.

An examination of Mr. Clarke's manuscript reveals the fact that he preserved all written sheets, however long he had discarded them ; and, in many genera he had evolved more than one scheme of arrangement, with subordinate groups whose names were some times modified without the explanation that would, no doubt, have been forthcoming had Mr. Clarke lived to see his labours through the press. The early part of the manuscript has received revision on several occasions, but the later portions are left less complete. In the genus *Carex* his groups received various names as his ideas developed. His views of groups or their names were not always consistent ; "series" are found to be higher and also lower than "sections" ; where this latter treatment is adopted by the author, the editor has used the word "sub-series" in place of "series." This is, however, almost the only case in which any change has been effected ; the author's work has been presented as close to the original manuscript as could be done. In *Eleocharis* and in *Rynchospora*, and thrice in *Carex*, there are double names, and in *Rynchospora* is a name which is admittedly a *Dichromena*. In *Fimbristylis* a note indicates that one species is out of place, and must be removed. At the end of each genus are what the author termed "residuary species"—those as to which he had not satisfied himself of their validity or affinity. These, as a rule, are ignored, the exceptions being when they bear numbers, or are new species, as in *Carex*. The numbers are those employed by the author, and his own intercalations are shown uniformly as *bis*, *ter*, &c.

Some years before his death Mr. Clarke had printed 144 plates, with corresponding text ; as these plates largely explain his views,

it is to be hoped that they may be issued to the public, as supplementary to these *New Genera and Species of Cyperaceae*, now issued as the eighth volume of the *Kew Bulletin*, *Additional Series*.

Botanical Magazine for August.—The plants figured and described are : *Caesalpinia japonica*, Sieb. et Zucc., *Indigofera hebepetala*, Benth., *Eucryphia cordifolia*, Cav., *Rhododendron kamtschaticum*, Pall and *Polystachya Lawrenceana*, Kraenzl., all from specimens which have flowered at Kew. *Caesalpinia japonica* was introduced into this country from Japan by Messrs. James Veitch & Sons, and flowered for the first time in their Coombe Wood nursery in 1887. It is hardy only in sheltered positions in the south of England. The material used for the illustration was produced by a plant growing in a recess under the south wall of the Temperate House. *Indigofera hebepetala*, a species widely distributed in the North-Western Himalaya, is not generally known in gardens, although it has been in cultivation at Kew since 1881, when it was received with many other plants as a bequest by the late Mr. G. C. Joad. It is hardy at Kew, where its crimson and rose-coloured flowers, borne in long axillary racemes, are produced freely during August and September. *Eucryphia* is an ornamental-flowering shrub from South Chile, which thrives out of doors in the milder parts of the British Isles. Its large white flowers have the appearance of those of a *Philadelphus*, and the Saxifragaceae, amongst several other orders, has been considered by botanists to contain the nearest affinities to the genus, which, in several respects, is an anomaly. It is now placed in a separate order—the Eucryphiaceae—near to Ternstroemiaceae. The plant flowered in Messrs. Veitch's Coombe Wood nursery in 1897, though it appears to have been first introduced in 1848 (not in 1878 as stated in the Magazine). The *Rhododendron* is a very small undershrub, only about 6 in. high, with rather large bright carmine-purple flowers. It is a native of North-Eastern Asia and North-Western America, and though quite hardy in Britain it is not easily cultivated. The Kew plants were raised from seed received from the Imperial Botanic Garden, St. Petersburg, in 1900. *Polystachya Lawrenceana* is an East Tropical African species singular amongst all those in cultivation in having a rose-pink lip which renders the plant much more attractive than most of its congeners. The plant figured was received from the Royal Botanic Garden, Glasnevin, in 1903, and flowered in June, 1906.

Madagascar Rubber Plants.—In "Le Caoutchouc et la Gutta Percha," of 15th June, 1908, Prof. H. Jumelle gives an account of two rubber plants of the Fort-Dauphin Division (cercle), Southern Madagascar, known to the natives as "Vahyvanda" and "Kidroa" respectively. These had not hitherto been determined botanically, but were dealt with under their native names by Jumelle in the supplementary chapter of his book, "Les Ressources Agricoles et Forestières des Colonies Françaises" (Marseille, 1907). The account there given was based on information supplied by

Capt. (now Commandant) Vacher, who was in charge of the Tsivory District (secteur) of Southern Madagascar from 1904 to 1907.

The two species have now been identified by Jumelle, from specimens collected by Sergeant Maurière, at the instigation of Commandant Vacher ; "Vahyvanda" as *Plectaneia elastica*, Jum. et Perr., and "Kidroa" as "*Mascarenhasia lisianthiflora*, DC. Neither species appears to be of much economic importance, and their chief interest is rather geographical and ecologic. At the most favorable estimate a native would take seven or eight days to collect a kilogramme of the rubber during the good season, April–June, and twice that time during October-November.

Plectaneia elastica was previously known only from the forest of Analamahitso, Haut-Bemarivo, North-West Madagascar, and it is somewhat surprising to find it in the extreme south of the island. In the Fort-Dauphin Division, according to Capt. Vacher, *P. elastica* grows into a bush 2½–5 ft. high, if there are no trees on which it can climb ; as a climber, however, it reaches the tops of the highest trees, but the stem nevertheless remains slender, hardly exceeding 1½ in. in diameter. In North-West Madagascar, on the other hand, Perrier de la Bathie saw stems measuring as much as 8 in. in diameter at the base. The same relation holds good for *Mascarenhasia lisianthiflora*, which in the south is a shrub 6–12 ft. high, with a stem about 1½ inch in diameter, whilst in the north-west it may become a tree 20 ft. high, with a trunk 8 in. in diameter. As a general rule, according to Jumelle, the species of North-West Madagascar become dwarfed as they approach the south of the island or the central plateau, and this relation extends even to representative species : thus *Cryptostegia grandiflora* of Southern Madagascar is a smaller plant and yields less rubber than *C. madagascariensis*, the corresponding species in the north-west.

The altitudinal distribution of *Plectaneia elastica* and *Mascarenhasia lisianthiflora* is the same in both parts of the island, the height of 2600 ft. (800 metres), being the lower limit of *P. elastica* and the upper limit of *M. lisianthiflora*.

T. A. S.

Experiments with Rubber Seeds.—Experiments have been carried out by Mr. H. F. Macmillan, Curator, and Mr. T. Petch, Government Mycologist, Peradeniya, as to the weight and germinative capacity of *Hevea* rubber seed.

The seed was collected from (A) a group of trees about 20 years old which had never been tapped and from (B) a group of trees about 30 years old which were tapped regularly in 1905 (29 lbs. of dry rubber being taken from eight trees in three months), occasionally in 1906, but not at all in 1907. One thousand seeds were taken from each group, and each 1,000 were divided into 10 lots of 100 each, which were weighed separately. One lot from each group was planted on September 14th, and the remaining lots were planted in pairs, after weighing at intervals of a week, until all were planted. It was found that the seeds lose weight rapidly during the first fortnight after collection, and then more gradually

till about the sixth week, after which time their weight remains more or less constant unless they are transferred to a drier atmos phere. The loss in weight appears to be due almost entirely to loss of water.

One thousand fresh seeds from untapped trees weighed on an average 4,126·83 grains or 9·1 lbs., and this figure agrees with results obtained by Mr. Carruthers five years previously.

The loss in weight takes place almost entirely from the kernel.

The seeds from group B weighed, when fresh, on an average 3,540·8 grains, which is 7·8 lbs., as the weight of 1,000 seeds from tapped trees.

It was from these trees that Mr. Carruthers obtained his seed in 1902 ; thus for

Group B.

1902 ... Untapped trees ... Weight of 1,000 seeds = 9·1 lbs.
1905 ... Trees tapped.
1907 ... ... Weight of 1,000 seeds = 7·8 lbs.

Group A.

1907 ... Untapped trees ... Weight of 1,000 seeds = 9·1 lbs.

It is also stated by a planter that 1,000 seeds from his trees (15 years old) formerly weighed 10 lbs., but now they average 7 lbs., having diminished 1 lb. each year during tapping.

From the experiment it was clear that the seeds from tapped trees are smaller, weigh less per 1,000 seeds, are actually denser, but lose more weight in drying than those from untapped trees.

With regard to the germination tests, it was found that seeds from untapped trees were practically worthless if kept longer than two weeks, but that the seeds of tapped trees keep better, and both in percentage of germination and time of germination are better than seeds from untapped trees. These results of course apply only to germination, and as yet there is no indication as to the quality of the trees which would result from the two sets of seeds.

The full details of the experiments are given in Circular No. 11 of the *Circulars* and *Agricultural Journal* of the Royal Botanic Gardens, Ceylon, vol. iv., for May, 1908. In the tables which are included for both groups the weights of the different lots of seeds and the percentage and time of germination is given. The circular concludes with a reference to the estimates of the return to be obtained by extracting oil from *Hevea* seed. Calculations have been made on the assumption that 1,000 seeds weighed 11 lbs. (Wright) and 9·1 lbs. (Carruthers), whereas from tapped trees 8 lbs. appears to be the more correct estimate for the weight of 1,000 seeds.

When dry and shipped to England the kernels constitute about 50 per cent. by weight of the whole seed and yield 42·3 per cent. of oil.

From these figures 280,000 fresh seeds or 350,000 dry seeds (yielding 700,000 kernels) = 1 ton.

The value of the kernels may be about £10 per ton.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 9.] [1908.

XLVII.—A NEW SPECIES OF BUTEA, WITH NOTES ON THE GENUS.

The genus *Butea*, proposed by Koenig to accommodate the 'Palas' or 'Dhak'—a well-known and striking Indian tree—and to commemorate the services to botany of the third Lord Bute, was published by Roxburgh (*Pl. Corom.*, vol. i. p. 21) in 1795. To the 'Palas,' which had already been figured by Rheede in 1686 (*Hort. Malab.* vol. vi. tt. 16, 17) and had been named *Erythrina monosperma* by Lamarck in 1783 (*Encyc. Meth.* vol. i. p. 391), Roxburgh added a second species, which differs in having larger flowers with longer pedicels, and in being a climber with stems that rise from a hypogaeal tuber-like base. The erect species Roxburgh named *B. frondosa*; the climber he termed *B. superba*. The diagnostic characters of *Butea* given by Bentham in 1865 (*Gen. Pl.* vol. i. p. 533) and by Taubert in 1894 (*Nat. Pflanzenfam.* vol. iii. 3, p. 365) apply precisely to Koenig's original genus. Bentham, however, and in this he was followed by Taubert, admitted the existence of a third species, *B. minor*, Ham., which is not precisely covered by these diagnoses.

In 1813 Roxburgh widened the scope of Koenig's genus by admitting another species, *B. parviflora* (*Hort. Beng.* p. 53), which was fully described in his posthumous flora (*Fl. Ind.* vol. iii. p. 248) in 1832. This species agrees with *B. superba* in habit and foliage; it differs in having a panicled inflorescence of more numerous, much smaller flowers, and has been referred by Bentham and Taubert to another genus.

In 1825 De Candolle (*Prodr.* vol. ii. p. 414) accepted the genus as enlarged by Roxburgh in 1813, and doubtfully added another species, *B. Braamiana*, DC., believed to be from China. This species was taken up from t. 23 in a collection of thirty drawings issued by Bohte in 1821 as 'Icones plantarum sponte Chinâ nascentium e bibliotheca Braamiana excerptae.' No *Butea* has been met with in China, and it is now known that Bohte's title page is slightly in error, for the same collection of thirty plates, arranged in a different sequence, was advertised by Cattley in 1818—in this

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case accurately—as a series of drawings of Chinese and Indian plants. The plate which forms t. 23 of Bohte's issue is t. 4 of Cattley's edition; it is one of the Indian drawings and represents with fidelity *B. frondosa* while in young foliage.

In 1826 Sprengel (*Syst. Veg.* vol. iii. p. 186) did not take up *B. parviflora* or *B. Braamiana*; he added, however, to Koenig's genus another species, *B. Loureirii*, based on *Genista scandens*, Lour. (*Fl. Cochinch.* vol. ii. p. 428); this plant, from internal evidence, we know must belong to another genus.

B. minor, Ham., which Bentham and Taubert have accepted as a *Butea*, was obtained from Nepal by Buchanan (afterwards Hamilton) in 1810. The species was not taken up in 1825 by D. Don (*Prodr. Fl. Nep.*); it was, however, issued by Wallich in 1830 (*Cat. Lith.* n. 5439 A) along with specimens of the same species (5439 B) collected by De Silva in the mountains of Silhet, i.e., the Jaintea Hills. Griffith met with it again in the same locality in 1837 as a gregarious shrub and sent a supply of seeds, under the name *B. suffruticosa*, to Voigt at Serampore; this name was subsequently published in Griffith's works (*Notul.* vol. iv. p. 443) in 1854.

In 1842 Hasskarl (*Flora*, vol. xxv. 2, *Beibl.* p. 52) proposed a genus *Spatholobus* for a Java plant, *S. littoralis*, with a pod like that of *B. parviflora*, and in 1846 Zollinger and Moritzi (*Nat. Gen. Arch. Ind. Ned.* vol. iii. p. 79) based a genus *Drebbelia* on another nearly allied species. Bentham in 1854 (*Miq. Pl. Jungh.* p. 238) reduced *Drebbelia ferruginea*, Zoll. & Mor., to *Spatholobus* as *S. ferrugineus* and at the same time reduced *B. parviflora*, Roxb., to Hasskarl's genus as *S. Roxburghii*—the term 'parviflora,' appropriate when used as Roxburgh used it, being meaningless when the species has to be reduced to *Spatholobus*.

In 1845 Voigt (*Hort. Suburb. Calcutt.* p. 239) accepted *B. parviflora*, Roxb., as a *Butea*. But on raising plants of *B. minor* from the seeds given him by Griffith in 1837 Voigt decided that this species is not a *Butea*, and published it, with a generic diagnosis, as *Meizotropis buteaeformis*. A detailed description, subsequently prepared by Griffith from living specimens in Voigt's garden, was published in 1854 (*Griff. Notul.* vol. iv. p. 441). Owing to an error the word *Meizotropis* appears there as *Megalotropis*, and this erroneous form is cited in the *Index Kewensis* and used by Taubert as if it were a new generic name proposed by Griffith. This citation does not represent Griffith's intention, since Griffith himself attributes the name to Voigt. It is not impossible, though it is unlikely, that Griffith by a *lapsus calami* wrote *Megalotropis* instead of *Meizotropis*; in all probability the altered orthography is one more instance of the editorial laxity conspicuous throughout Griffith's posthumous papers. We know, indeed, from a manuscript name attached by Griffith to a fruiting specimen of *B. minor* from the Serampore garden, that his final view was that the plant is a *Butea*.

The divergence of view as to the status and limits of *Butea*, Koen. (based on *B. superba* and *B. frondosa*), of *Meizotropis*, Voigt (based on *B. minor*), and of *Spatholobus*, Hassk. (to which *B. parviflora* has, since 1854, been uniformly referred), invites a

reassessment of their differential characters. In habit and foliage *B. superba*, *B. minor* and *B. parviflora* are so similar that without flowers one might be confused with either of the others. In fruit all three agree. As regards calyx, stamens and pistil they differ only in size; in this respect *B. minor* with calyx 8 mm. long, stands about midway between *B. superba* with calyx 16 mm. long, and *B. parviflora* with calyx 4 mm. long. As regards corolla the three, as the characters detailed below indicate, differ almost equally :—

Butea, Koen. (1795); vexillum ovatum, acutum, recurvum; alae falcatae, acutae, carinae parum adhaerentes; carina valde incurva, acuta, vexillum alasque aequans; petala aurantiaca; flores insignes, 5-7 cm. longi.

Meizotropis, Voigt (1845); vexillum ovatum, subobtusum, recurvum; alae oblique oblongae, liberae; carina incurva, subobtusa, vexillum alasque superans; petala aurantiaca; flores mediocres, 1·75–2·75 cm. longi.

Spatholobus, Hassk. (1842); vexillum ovatum vel suborbiculatum; alae oblique oblongae, liberae; carina rectiuscula, obtusa, vexillo alisque brevior; petala purpurea, rosea vel alba; flores parvi, 0·6–0·9 cm. longi.

From this we see that while *Meizotropis* agrees with *Butea*, in which it is included by Bentham and Taubert, as regards colour of petals, it agrees better with *Spatholobus*, which Bentham and Taubert refer to another subtribe, as regards the shape and relationship of the wings. Since the characters to be derived from the corolla are insufficient to warrant the generic separation of *Meizotropis* from *Butea*, they must be equally inadequate to warrant the generic separation of *Spatholobus* from the widened *Butea* in which *Meizotropis* is merged. The segregation of *Spatholobus* is so convenient that its perpetuation is desirable, but it has to be recognised that this segregation depends entirely on a difference of facies resulting from the possession of a greater number of smaller and differently coloured flowers, and is unsupported by any morphological character. This being the case, it seems clear that, even if the generic status accorded to *Spatholobus* can be upheld, we are not entitled to refer that genus to a subtribe apart from the one in which *Butea* (including *Meizotropis*) is placed.

It is just as convenient, considering the small number of species involved, to follow Bentham and Taubert in uniting *Butea* and *Meizotropis* as it is to follow them in keeping *Spatholobus* apart. Since, however, the definitions given by these authors are so framed as to exclude the species *B. minor*, which they have formally included in *Butea*, it is desirable to accord sectional rank within their *Butea* to the group *Meizotropis*, proposed as a genus by Voigt. The recent communication of a hitherto unknown Indian species, closely allied to *B. minor*, Ham. (*Meizotropis buteaeformis*, Voigt), renders the recognition of this section almost essential.

The plant in question was sent from Patwa Dangarh, near Naini Tal in the Kamaon Himalaya, by Capt. C. A. Sprawson, I.M.S., to Sir J. D. Hooker, who has named it *B. pellita*, and has presented

the material to Kew with the request that a description of the species be provided. Capt. Sprawson states that the plant is known locally as 'Patwa,' a name that in the plains of India is applied to the Rozelle (*Hibiscus Sabdariffa*); that it gives its name to the place—Dangarh connotes a small plain among the hills—in which it grows; that the natives say the plant is limited to this particular hill-top and cannot be found elsewhere. Captain Sprawson is satisfied that whether it occurs in places more remote or not, it is certainly restricted in the neighbourhood of Naini Tal to the particular area, less than a mile square, whence his specimens come. Probably, therefore, the plant is at least local in its occurrence, and this may partly explain the absence of so striking a species from previous collections. Capt. Sprawson's specimens in fruit were gathered in October, 1907; flowering specimens were subsequently obtained by him in June, 1908.

Another circumstance almost sufficient, in the absence of fruit, to explain this plant having been overlooked is the close resemblance it bears to *B. minor*, Ham., a species which inhabits the Assam hills to the east of the river Brahmaputra and the Himalaya from Sikkim westward to Kamaon. The tomentum is somewhat lax in *B. pellita*, closely adpressed-silky in *B. minor*; otherwise there is nothing to distinguish the adult leaves of the two; in both cases the largest leaves frequently attain a length and breadth of three feet. Usually *B. minor* is a heavy climber, whereas *B. pellita*, so far as we yet know, is a shrub rarely exceeding four feet in height. Sometimes, however, *B. minor* is a gregarious shrub; we have seen that Griffith, who found the species in this condition in the Jaintea Hills in 1837. used for the erect form the distinctive name *B. suffruticosa*. On casual examination the flowers of *B. pellita* might be mistaken for those of *B. minor*; they are the same in colour, and the petals of both impart a rich orange tint to water in which they are placed; the only distinguishing features are that the tomentum on the calyx and petals of *B. pellita*, like that on the young leaves, is suberect and velvety, whereas the tomentum on these organs in *B. minor* is, like the leaf-tomentum, closely adpressed, and that the flowers of *B. pellita* are distinctly smaller, being only 1·75 cm. long as against 2·75 cm. long in *B. minor*.

Closely related, however, as the two species are, their fruits are very different. In *B. minor* the pod is like that of *B. superba* or of *Spatholobus Roxburghii* (*B. parviflora*); it has a long flat indehiscent empty basal portion with a short thick 1-seeded 2-valved apical chamber. In *B. pellita* the pod, though 1-seeded by abortion of the lower of the two ovules, has the solitary seed some distance below the organic apex, and is more like that of a *Dioclea* than that of a typical *Butea*. This striking difference, however, is not greater than the difference which exists in *Hypaphorus*, Hassk., as compared with *Erythrina*; and since in the latter case the character is insufficient to warrant the treatment of *Hypaphorus* (*Erythrina lithosperma*) as generically distinct from *Erythrina* proper, it is necessary, for the sake of uniformity, to consider *B. pellita* a member of *Butea* § *Meizotropis*.

A brief revision of *Butea*, Koen., in accordance with the considerations stated above, is subjoined.

Butea, *Koen.*; *Benth. in Benth. & Hook. f. Gen. Pl.* i. 533 (1865); *Taub. in Engl. & Prantl, Nat. Pflanzenf.* iii. 3, 365 (1894); calycis dentes vel lobi breves, 2 superiores connati; vexillum ovatum, recurvum; carina incurva; stamen vexillare liberum, caetera connata; antherae uniformes; ovarium 2-ovulatum; stylus elongatus, incurvus, imberbis, stigmate terminali minimo; legumen 1-spermum; semen plano-compressum, obovatum, hilo parvo estrophiolato; folia pinnatim 3-foliolata, stipellata; stipulae caducae; flores aurantiaci, dense fasciculati, fasciculis racemosis vel fasciculato-paniculatis; bracteae et bracteolae caducae.

§ 1. **Eubutea**; vexillum acutum; alae falcatae, acutae, carinae parum adhaerentes; carina acuta, vexillum alasque aequans; legumen basi longe planum indehiscens et vacuum, summo apice crassum 2-valve; flores insignes. *Butea*, Koen. ex Roxb. Pl. Coromand. i. 21.

1. **B. frondosa,** Roxb.; arbor; pedicelli calyce vix duplo longiores; flores 5 cm. longi. *Pl. Corom.* i. 21, t. 21 (1795); *Fl. Ind.* iii. 244; *DC. Prodr.* ii. 415; *W. & A. Prodr.* 261; *Brand. For. Fl.* 142; *Hook. f. Fl. Brit. Ind.* ii. 194. B. Braamiana, *DC. Prodr.* ii. 445 (1825). B. monosperma, *Kuntze Rev. Gen.* 202 (1891); *Taub. in Engl. & Prantl. Nat. Pflanzenf.* iii. 3, 365. Erythrina monosperma, *Lamk. Encyc. Meth.* i. 391 (1783).

Distrib. Throughout India and Burma. The leaves of this species are occasionally 1-foliolate; a specimen showing this abnormality has recently been communicated to Kew by Mr. Hole, of the Indian Forest Service.

2. **B. superba,** *Roxb.*; frutex alte scandens; pedicelli calyce triplo longiores; flores 7 cm. longi. *Pl. Corom.* i. 23, t. 22 (1795); *Fl. Ind.* iii. 247; *DC. Prodr.* ii. 415; *W. & A. Prodr.* 261; *Brand. For. Fl.* 143; *Hook. f. Fl. Brit. Ind.* ii. 195.

Distrib. Throughout India and Burma.

§ 2. **Meizotropis**; vexillum subobtusum; alae oblique oblongae, obtusae, liberae; carina subobtusa, vexillum alasque superans; flores mediocres. *Meizotropis*, Voigt. Hort. Suburb. Calcutt. 239; Griff. Notul. iv. 441 (sphalm. *Megalotropis*).

3. **B. minor,** *Ham.*; frutex saepius alte scandens nonnunquam erectus; folia floribusque adpresse sericea; legumen basi longe planum indehiscens et vacuum, summo apice crassum 2-valve; flores 2·75 cm. longi. *Ham. in Wall. Cat.* 5439 A (1830); *Hook. f. Fl. Brit. Ind.* ii. 195. B. suffruticosa, *Griff. Notul.* iv. 443 (1854). Meizotropis buteaeformis, *Voigt Hort. Suburb. Calcutt.* 239 (1845); *Griff. Notul.* iv. 441 (*sphalm.* Megalotropis).

Distrib. Assam: Khasia, *Hooker & Thomson!* Jaintea, *De Silva! Griffith!* Naga Hills, *Clarke!* Mishmi, *Griffith!* Himalaya: Sikkim, *Gamble!* Nepal, *Buchanan* (*Hamilton*)*!* Kamaon, *Duthie!*

4. **B. pellita,** *Hook. f.*; frutex erectus; folia juniora floribusque velutina; legumen basi vacuum haud elongatum infra apicem 1-spermum; flores 1·75 cm. longi.

Frutex erectus metralis vel paullo ultra, innovationibus ubique dense velutinis. *Folia* pinnatim 3-foliolata, adulta parce praecipue subtus et praesertim secus nervos pilis albidis obsita; foliola 30–60 cm. longa, 25–50 cm. lata; petioli 10–20 cm., petioluli 1 cm. longi; stipelli lanceolati, foliacei, 1 cm. longi, 4 mm. lati; stipulae foliaceae, triangulari-ovatae, subacutae, 2 cm. longae, 1·5 cm. latae, caducae. *Flores* aurantiaci, dense fasciculati, fasciculis 3–5-floris inter se ·5–1·5 cm. remotis racemosis; racemi axillares, 20 cm. longi, rhachidibus sublignosis angulatis nodosis 4 mm. crassis; bracteae stipellis conformes; bracteolae bracteis simillimae nisi minores; pedicelli graciles, 5 mm. longi. *Calyx* campanulatus, intus sericeus, dentibus brevibus 2 superioribus in labium integrum connatis, 7 mm. longus, 5 mm. latus. *Corollae* vexillum ovatum, subobtusum, recurvum, inappendiculatum, 1·25 cm. longum, 1 cm. latum; alae oblique oblongae, obtusae, incurvae, liberae, 1·5 cm. longae; carina incurva, petalis apicem versus tantum connatis, subobtusa, 1·75 cm. longa. *Stamen* vexillare liberum; caetera connata; antherae uniformes. *Ovarium* sessile, 2-ovulatum; stylus incurvus, imberbis, stigmate terminali parvo. *Legumen* subsessile, ovato-oblongum, coriaceo-lignosum, velutinum, paullo infra summum apicem 1-spermum, basi vacuo hand elongatum, 8 cm. longum, 4·5 cm. latum. *Semen* planocompressum, suborbiculare, 2 cm. diametro, testa castanea, hilo parvo estrophiolato.

Distrib. Himalaya: Kamaon; Patwa Dangarh, near Naini Tal, 1530 m., *Sprawson!*

Species excludendae.

Butea acuminata, *Wall.*	=	Spatholobus acuminatus, *Benth.*
gyrocarpa, *Grah.*	=	gyrocarpus, *Benth.*
Loureirii, *Spreng.*	=	Quid? *vide infra.*
parviflora, *Roxb.*	=	Spatholobus Roxburghii, *Benth.*
peltata, *Pers.*	=	Rudolphia peltata, *Willd.*
sericophylla, *Wall.*	=	Spatholobus Roxburghii, *Benth.*
volubilis, *Pers.*	=	Rudolphia volubilis, *Willd.*

B. Loureirii, Spreng. (*Syst. Veg.* vol. iii. p. 186), is based on *Genista scandens*, Lour. (*Fl. Cochinch.* vol. ii. p. 428 (1790); ed. Willd. vol. ii. p. 521). In 1793 Willdenow queried the reference of Loureiro's plant to *Genista*. The fact that it has 2-pinnate leaves shows that it cannot be a *Genista*, as Loureiro thought, and proves that Sprengel's suggestion is equally untenable. While, however, it is certain that the species is not a *Butea* its identity is not altogether clear.

Genista scandens is described by Loureiro as a large climber armed with numerous simple short scattered recurved spines; it has 2-pinnate leaves with ovate entire opposite leaflets. The flowers are yellow, disposed in large lax terminal pendulous racemes; the corolla is papilionaceous with an oblong reflexed standard; the ten stamens are united. The pod is subrotund, compressed, glabrous, with a solitary large compressed seed.

Unfortunately, as Dr. Rendle, who has kindly interested himself in this matter, informs us, the type of *G. scandens* is not present among the Loureirian specimens at the British (Natural History)

Museum; we are therefore only able to guess at the species intended. All the large Asiatic armed leguminous climbers that have 2-pinnate leaves belong to the tribe *Eucaesalpinieae*, and as these never have papilionaceous corollas and always have free stamens, it is clear that Loureiro has either described the flowers of *Genista scandens* incorrectly or has mistaken the flowers of another plant for those of his species. The fact that *Genista scandens* has 1-seeded pods considerably narrows the field of enquiry. The only genus of *Eucaesalpinieae* in which the pod is uniformly 1-seeded is *Pterolobium*; this genus we are able to exclude since its pods are samaroidly winged and not subrotund. In the remaining Asiatic genera of this tribe there are only three species with 1-seeded pods, viz. :— *Mezoneuron cucullatum*, W. & A., a species as common in Cochin-China as it is in India; the species described as *Mezoneuron sinense*, Hemsl. (*Journ. Linn. Soc. Bot.*, vol. xxiii., p. 204), a Central Chinese plant, which is really a species of *Caesalpinia* § *Nugaria* (*Journ. As. Soc. Beng.*, vol. lxvi. 2, p. 470); and *Caesalpinia* (*Nugaria*) *Nuga*, Ait., a species widely spread throughout South-eastern Asia, and especially plentiful along the swampy margins of tidal rivers. *Mezoneuron cucullatum* is the species which the remarks of Loureiro as to the size of his plant and to the pleasing effect produced by its masses of yellow flowers most naturally suggest. This species nevertheless is to be excluded owing to the fact that its pods are oblong and much longer than broad. *Caesalpinia sinensis*, Prain (*Mezoneuron sinense*, Hemsl.) may also be excluded since it does not extend so far southward as Cochin-China, and it is almost safe to conclude that *Butea Loureirii*, Spreng. (*Genista scandens*, Lour.) is *Caesalpinia Nuga*, Ait. (*Guilandina Nuga*, Linn.). The element of doubt which must necessarily exist owing to the account given by Loureiro of the corolla and stamens should be removed without difficulty by observation in the field since the species intended is said by Loureiro to be plentiful in Cochin-China near the banks of rivers, climbing to the tops of the highest trees; Loureiro gives besides a vernacular name, 'Cây Gieng-gieng,' which ought to facilitate the identification of his plant.

D. Prain.

XLVIII.—SOME CONTINENTAL GARDENS AND NURSERIES.

W. J. Bean.

In June last, at the instance of the Director, I spent 24 days on the Continent visiting as many famous gardens, parks and nurseries as time permitted. The objects of this journey were, primarily, to observe new and different methods of culture; to note plants not in the tree and shrub collections at Kew with a view to their acquisition; and to study landscape effects. The chief towns and cities I visited were Brussels, Rotterdam, Leer, Bremen, Hanover, Berlin, Dresden, Prague, Vienna, Ischl, Munich, Nancy and Paris.

Most of these places possess what we know as a continental climate ; that is to say the winters are colder than those of Britain, and the summers much hotter. These extreme conditions as to temperature result, generally, in a great reduction in the number of evergreens that can be grown as compared with Britain, but, on the other hand, in a finer development of many deciduous flowering trees which in our country are very subject to injury from spring frosts. Thus some of the deciduous American, Asiatic, and Caucasian trees, which I saw in considerable numbers, are only to be equalled in Great Britain, by a specimen out of the common, here and there. But, so far as I was able to observe, there is nothing in Central Europe to equal the Asiatic and West American conifers as one sees them grown, for instance, in the gardens of Perthshire. Each type of climate has its advantages and disadvantages, but, on the whole, the advantage is decidedly with our own so far as the cultivation of ornamental trees and shrubs is concerned.

One could not justly base a criticism of continental landscape gardening on a visit of so short a duration as mine. For one thing, most of the places I saw are not an expression of the more recent phases of landscape art ; they represent the thoughts and modes of 100 to 200 years ago. But Versailles and its tradition, it would appear, has had a desolating effect on the gardens of Europe. Every petty monarch or prince seems to have felt it necessary to support his dignity by aping the methods of the great Louis, as far as his means allowed, and one result was often a Versailles on a small scale. About the time of the French Revolution more poetical and romantic ideas with regard to gardens began to prevail, and they found their expression in the so-called "English Garden" of the time. Marie Antoinette herself made one at Petit Trianon—a charming spot. But the "English Garden" was very frequently as extreme in one direction as is Versailles in another. The least approach to formality was tabooed, and the paths and promenades took very tortuous lines, often meaningless in so far as their curves and windings led to nothing in particular. With a century's tree-growth upon them, some of these "English Gardens" have in their way become as monotonous as Versailles.

Brussels and Tervueren. June 2, 1908.

The chief object in visiting Brussels was to see the newly formed Arboretum at Tervueren. This has been planned by, and is under the control of Professor Bommer, conservator of the Botanic Garden at Brussels. The out-door department of the Brussels Botanic Garden does not offer many features of interest, and neither in position nor extent can it be described as worthy of the capital of Belgium. On the other hand the glasshouses are excellently managed—there is a very fine collection of rare plants, admirably cultivated. No doubt the new plantations at Tervueren are intended to relieve the Brussels Botanic Garden altogether of the attempt to grow a botanical collection of trees and shrubs. The best use to which it could be put would be to transform it into an ordinary town garden, and to transfer the out-door collections entirely to Tervueren.

The journey from Brussels to Tervueren is worth making, if only for the sake of inspecting the splendid plantations of beech, managed on scientific forestry principles, which border the track of the electric tramway for a part of the way. Before leaving Brussels a short detour was made to visit the charming Bois de la Cambre. This park is well worth seeing for its fine trees, especially beech, and for the pleasing and diversified prospects which it affords.

The village of Tervueren is situated in a pleasant, open and undulating country. It is a quaint and interesting place, and fills a place in history through having been for six or seven centuries a seat of the Dukes of Brabant. Remnants of the old ducal chateau still exist.

The Arboretum, which was only founded some six years ago, covers about 300 acres. The picturesque and undulating site it occupies is largely covered at the present time with young native woodland. It is planned on purely geographical lines, a definite area being devoted exclusively to the trees of one particular region. The two great primary divisions of the Old and the New World are divided and sub-divided into areas whose size has been determined by the extent and character of tree vegetation they are intended to accommodate. Thus we find the trees of the Rocky Mountains, those of the Mississippi basin, those of the Caucasus, those of Japan, and so on, collected into separate groups. Every region, in fact, on which a characteristic arboreal vegetation exists, hardy enough to succeed here, has its own allotted space. Most of the trees although still young, are thriving well. Some are planted in groups of a single species ; sometimes two or three species are planted in association. They are planted in clearings of the young native woodland, which is useful now in affording shelter, but which it is intended to gradually clear away as the exotic vegetation develops.

The Arboretum was given by the King of Belgium for its present purpose, to form a pleasant place of resort for the people of Brussels, and has been very skilfully planned so as to preserve and develop the beauty of its landscape. The charming valleys by which the site is intersected are left open, and serve the double purpose of affording pleasant and varied prospects, and giving convenient routes from one part to another. Some of the approaches to the Arboretum are planted with long avenues of purple beech, which, although still young, give singularly striking effects. The trunks of these trees are not pruned clean, but the side-shoots are trimmed back so as to form a kind of bushy column round the trunk reaching from the ground to the lower branches of the tree. The chief purpose of this system is to shield the young trunks from the effects of the Continental sunshine. Also, by increasing the leaf-surface of the tree, they augment its wood-producing capacity. When the trees have grown sufficiently to shade their own trunks, these side-shoots are removed. A well-kept and well-stocked nursery for trees makes a useful and interesting adjunct to the Arboretum. It should be added that it is intended eventually to supplement the collections of trees by shrubs and herbaceous plants from the same regions.

A geographical arrangement of trees is a favourite feature in the botanic gardens of the Continent. Even in small ones, where

there is not sufficient space for an arboretum planted according to botanical relationship, crowded groups of trees with a geographical affinity are to be found. Unless the planting is done on broad and spacious lines, it appears to me to have but a small educational value. But no reproach of that kind can be made against the Arboretum at Tervueren. It is planned on a generous scale, and if the original scheme is carried out, it should develop into the finest and most interesting thing of its kind in Europe.

Boskoop (near Gouda in Holland). June 3.

In recent years no locality on the continent of Europe has come more prominently into the notice of the horticultural world than Boskoop. This little town is within easy reach of Rotterdam, the journey being made as far as Gouda by train, and thence by boat to Boskoop. The region is typically Dutch, the land being perfectly flat as far as the eye can reach, and cut up into long, rectangular areas by an elaborate system of canals. The level of the water in these canals can be altered at will by means of pumps and sluices. When conflicting interests are involved, the water level is decided on by a majority vote of the people concerned in each particular section. In June last it was from 1 to 1½ ft. below that of the land. The traffic of the nurseries passes over these waterways, plants, materials, etc., being taken from one place to another by means of boats. The soil is of a dark, peaty nature, and of so soft and springy a character that the vibrations caused by one person jumping on the ground can be felt by another several yards away. These conditions have proved to be extraordinarily favourable for the growth of many trees and shrubs, and Boskoop has, in consequence, become the centre of a remarkable colony of nurseries. I was told that over six hundred firms who make the cultivation of trees, shrubs, and other plants their business are established in this neighbourhood.

Whilst almost every species and variety of tree and shrub that is hardy in the climate appears to thrive here, Boskoop is particularly suitable for the cultivation of those finer-rooted plants which in the majority of gardens require rather special care and treatment. Thus, rhododendrons, azaleas, kalmias, and magnolias of the *conspicua* type thrive exceedingly well, as do conifers of various sorts, especially the firs and spruces. The silvery-leaved forms of *Picea pungens* make most striking pictures when grown in nursery masses, as one sees them here. Of the several forms seen, the finest is called *P. pungens*, var. *Kosteri pendula*. Japanese maples are grown in large quantities, also the Asiatic wistarias, flowering cherries, and roses. *Tilia dasystyla* (*T. euchlora*), the Caucasian lime, which is so promising as a tree for street planting, is abundant in these nurseries.

Mr. Hesse's Nursery, Weener, Hanover. June 5.

It is a long and tedious journey from Rotterdam to Weener, which is situated near Leer in north-west Hanover, and there is but little of interest on the route. The flat, canalised lowlands of Holland give place as one travels northwards to another type of

country almost equally flat but much drier. It is here that one first encounters the immense plantations of Scotch pine which fill so much of the landscape as seen from the train all the way to Berlin, and then southwards to Dresden.

Mr. Hesse's nursery has long been known to us at Kew as one of unusual size and interest. It covers 100 hectares and some 250 people are employed in it. Admirably kept and managed, it is at the present time a remarkable testimony of what one man's business capacity and organising qualities can accomplish, for it is entirely the creation of its present owner. Mr. Hesse grows a large number of fine specimen trees which are kept, not to sell, but as permanent features of the nursery and as stock plants. Among them are many rare and interesting things. *Picea Breweriana*, for instance, is here, a single plant raised from seed 15 years ago. This plant and one at Kew are believed to be the only two trees of this species in Europe at the present time, except for the few plants which have been raised from them by means of grafts and cuttings. There is a singularly beautiful variety of the common spruce whose young shoots are creamy white; it was raised here, and is called *Picea excelsa*, var. *argenteo-spica*. The new cork-barked fir from Arizona (*Abies lasiocarpa*, Hook., var. *arizonica*) is grown in large quantity. The Servian spruce (*Picea Omorica*) by its behaviour here, confirms the high opinion of its merits we had already formed at Kew. The rare Japanese *Abies Mariesii* has hitherto been so difficult to obtain that it was a surprise and pleasure to find it here in considerable numbers. But Mr. Hesse has always kept a keen look-out for new things. The West American larch (*Larix occidentalis*), for instance, about which hopes are entertained that it will make a substitute for the common larch in British woods, was introduced to this nursery and grown more than twenty years ago. It is evidently not so hardy as *L. europaea*, for it would not stand the winters at Weener. In connection with the question of hardiness in North Europe, it may be of interest tc some readers of the *Kew Bulletin* to learn, on the authority of Mr. Hesse, that *Crataegus coccinea* (North American) and *C. sanguinea* (North Asiatic) are hardy in parts of Russia where the common thorn (*C. Oxyacantha*) will not live. It would occupy too much space to enumerate one-tenth of the interesting plants in the Weener nursery. There are enormous breadths of garden rhododendrons, many fine lilies and herbaceous plants. And as for the commoner forest trees, and trees used for street planting, they exist in hundreds of thousands.

Herrenhausen, Hanover. June 6.

Leaving Weener on the evening of June 5, Bremen was reached the same night. The following morning, after a brief inspection of one of the town parks, which was found to contain many fine old trees, notably weeping ash, fastigiate oak, and some large Magnolias, the journey was resumed to Hanover. The point of interest in Hanover is Herrenhausen, an ancient seat of the Kings of Hanover. The place has a particular association with Kew because the last King of Hanover lived for some years in Hunter House, the building on Kew Green near the Main Entrance which afterwards became the Kew Herbarium. The private grounds in

which it stands are still sometimes spoken of as the "King of Hanover's Grounds." To botanists and horticulturists Herrenhausen is also interesting for the gardens that surround it, and especially the Botanic Garden.

The political differences which long existed between the Dukes of Cumberland and the Government of Prussia, and the consequent absence of the former from his home at Herrenhausen has no doubt led to the gardens there suffering considerable neglect. It was fortunate that for many years they were under the superintendence of Mr. Wendland, an enthusiastic botanist and gardener, and an *élève* of Kew.

The most striking object in the Botanic Garden is the Palm House. This lofty structure affords head room for the growth of many magnificent palms At one time the collection here exceeded in extent any other in Europe. In the grounds are many interesting trees and shrubs of unusual size. The curious Araliad from China, *Acanthopanax sessiliflorum*, is represented by a bush 12 ft. high and 21 ft. across. *Pyrus floribunda* is a tree 35 ft. high, 42 ft. through, and has a trunk 4 ft. 3 in. in girth. *Viburnum plicatum*, a bush 8 ft. high and 12 ft. through, with every twig bearing its large pure white truss, made a dazzling picture. Many finely developed oaks are here; amongst them, *Quercus heterophylla*, with a trunk 10 ft. 6 in. in girth; *Q. coccinea*, 8 ft. 9 in.; *Q. imbricaria*, 9 ft. 2 in.; and *Q. Toza pendula*, 4 ft. 5 in. The Constantinople nut (*Corylus Colurna*) made a lofty pyramid 45 ft. through at the base, with its lower branches reaching to the ground. Perhaps the most beautiful of all the deciduous trees in this part of Germany are *Acer dasycarpum* and its variety *laciniata*. Both of them grow into large trees of a peculiarly elegant mode of growth, the ultimate branches being long and pendent, and of a pretty, glaucous hue beneath the leaf. Other good maples are *A. saccharinum*, 6 ft. 9 in., and *A. monspessulanum*, 5 ft. 5 in. in girth of trunk. The Kentucky coffee tree (*Gymnocladus canadensis*), of which there are but few really big specimens in Britain, is here about 70 feet high, with a trunk girthing 7 ft. 4 in. The red chestnut (*Æsculus carnea*) is, in size, more like the common horse chestnut in England. *Betula nigra*, always distinct for its dark rugged bark, is 7 ft. 6 in. in girth. The interesting Japanese tree, *Cercidophyllum japonicum*, so disappointing in Kew through its liability to injury by spring frosts, thrives particularly well in Central Europe. Here in Herrenhausen, a graceful young tree, 20 ft. high, with a clean trunk 1 ft. 8 in. in girth, was in perfect health, and growing rapidly. Among other trees of more than ordinary merit were *Sophora japonica*, girthing 10½ ft.; *Crataegus Crus-Galli*, var. *prunifolia*, 6 ft. 9 in.; *Pterocarya caucasica*, with rough scaling bark, 10 ft.; *Nyssa aquatica*, 4 ft. 4 in.; *Magnolia cordata*, 35 ft. high, 3 ft. 1 in. in girth; and *Tilia petiolaris*, 9 ft. 2 in. in girth.

One of the most famous features of Herrenhausen is a double avenue of lime trees leading from the house to the mausoleum. Loudon wrote of these "alleys" more than seventy years ago as having "long been celebrated." They have recently been headed back almost to the trunks—a necessary operation, no doubt, on account of their age.

There yet remains to be noticed the formal garden which fills a huge area in front of the house, and provides such a vivid contrast to the Botanic Garden we have just left with its fine trees, lawns, and shady walks. This formal garden is a striking illustration of the numerous gardens on the Continent whose designers drew their inspiration from Versailles. It is situated on a perfectly flat piece of ground, and consists chiefly of a series of avenues and straight walks radiating from circular open spaces. The morning of June 6, like the previous night, had been rainy, and many of the walks were a morass of mud two to three inches deep. A large part of the workmen's time must be taken up with such purely mechanical work as clipping the interminable hedges and raking over the walks. A sheet of water of considerable size and several circular basins give some interest to the place, but little gardening of a genuine nature is done, and few flowers are to be seen. Statuary, however, is abundant. The triangular spaces formed by the radiating walks are frequently enclosed by high clipped hedges of hornbeam, and these enclosures have sometimes been made into little orchards—a quaint and old-world feature. But, on the whole, this huge formal garden is depressing. An indefinable air of sadness pervades the place, and as one traverses the maze of walks and avenues in search of some pleasing feature, one keeps on asking oneself the question, "What is the good of it all?" without ever finding a satisfactory answer.

Berlin. June 7 to June 10.

The stranger interested in trees seeks out, on his first arrival at Berlin, the famous Unter den Linden. As a street, with the magnificent Brandenburg Gate at one end, it ranks as one of the finest in Europe. But as an example of arboriculture it is disappointing. The limes are healthy but small, and very much of the type to be seen in hundreds of streets in the suburbs of London. They are planted to form an avenue along the middle of the street, leaving a space for carriages and other traffic at the sides.

Through the Brandenburg Gate one reaches the Thier Garten. This is an area of perhaps 200 acres, largely covered with wood. Whilst the walks by which it is intersected afford agreeable and shady promenades for the people of Berlin in summer, the whole is of a monotonous character, and the trees themselves present no striking features. They are growing too thickly to develop into fine individual specimens, but not thickly enough to represent good forest conditions. It cannot be compared with the delightful Bois de la Cambre on the outskirts of Brussels.

My chief object in visiting Berlin was to see the national Botanic Garden at Dahlem. This is a new garden, founded only some five or six years ago, and it is new not only in point of age, but also in ideas. Whilst there is not a little which invites criticism, there is much that claims one's admiration, and much that is full of suggestion. No attempt, however, will be made to describe it at the present time, as the subject is too important a one to be dismissed in a few paragraphs and it has recently been well and fully dealt with in the "Gardeners' Chronicle."

The open spaces of Berlin are too often planted with that same lack of inspiration with which we are so familiar in this country. But occasionally one sees striking and pleasing effects. There is a fine series of thorns in the König Platz, and one sees admirable specimens of the Rouen lilac (*Syringa chinensis*) grown as standards. In early June a very attractive display was made by the Diervillas. A favourite form of garden decoration is the training of Virginia creeper and other climbers in festoons reaching from the trunk of one tree to another.

No one interested in landscape work should visit Berlin without seeing the waterfall in the Victoria Park. This park is situated on the sides of a conical hill which is the highest point for some distance round, and affords an extensive view over Berlin. The summit of the hill is crowned by a monument recalling the battles of the last Napoleonic campaigns, 1813–5. But the great feature of the park is an artificial waterfall which courses down one side of the hill. It is modelled on a steep mountain gorge, and there is nothing skimpy or makeshift in either the design or its execution. The water, which is supplied in splendid profusion, rushes down the gorge over immense boulders arranged in perfect imitation of nature, and the sides are overhung with a profuse and picturesque vegetation. The whole thing, however, which is the work of a genius, is marred by one defect. As one stands at the bottom of the hill looking up the gorge through which the masses of water are tumbling down, the eye finally rests on the black, ugly, Gothic monument at the top recalling the defeats of Napoleon. This is sufficient to destroy all *vraisemblance*, and it is curious that the authorities who manage this park do not block out the sight of the monument from this particular point, as could easily be done by planting some quick-growing tree at the top of the gorge.

Mr. L. Späth's Nursery. June 9.

There are few firms of nurserymen which can boast of as long and successful a career as that which has its present head in Mr. Ludwig Späth, of Baumschulenweg near Berlin. The founder of the firm, Christoph Späth, was born in 1696, and the business was in his hands from 1720 to 1746. He was succeeded by Carl Frederick Späth—1746 to 1782; then by another Carl Frederick—1782 to 1831. Johann Carl Ludwig Späth carried on the business from 1831 to 1863, and since then it has been in the hands of the present owner. The firm of Späth may, indeed, be regarded as a national asset of Germany. Some idea of the reputation it holds among leading men may be gathered from the fact that both Bismarck and Moltke honoured the nursery by planting memorial trees therein with their own hands.

The nursery covers at the present time 1,300 morgen (about 820 acres), and is being increased almost yearly. An enormous business is done all over Northern and Central Europe in trees and shrubs for every purpose. Whilst, to meet demands of this nature, enormous areas of the commoner trees such as planes, limes and various maples are grown, the nursery has besides been long noted for the large collections it contains. There are few nurseries in the world which contain so large and varied a stock.

Mr. Späth maintains near his dwelling-house a large arboretum, which is private garden as well. Here is cultivated in permanence a very extensive standard collection, and many of the trees have developed into notable examples of their kind. It should be mentioned, as showing the spirit in which the business is conducted, that a skilled botanist is attached to the firm, whose duty it is to see that everything in the nursery is correctly named.

Perhaps the most beautiful shrub in flower on June 9 was *Lonicera Korolkowii*, a comparatively new species from Turkestan. Bushes of this, 8 ft. high, were covered with exquisite pale pink flowers, displayed in most attractive fashion by reason of the free graceful habit of the shrub. Another very striking shrub was the pubescent variety of *Chionanthus virginica*, 12 ft. high, and loaded with its thyrses of white, narrow-petalled flowers. *Cornus Späthii*, a yellow-leaved variety of *C. alba*, usually regarded as the best of all yellow-leaved shrubs, originated in this nursery. The interesting fact was learnt that it first appeared as a sport from a stock plant on which had been grafted a variegated Cornus, the graft itself having died. *Rhododendron Ungerni*, a rare plant allied and very similar to *R. Smirnowi*, is here; it is distinguishable by the cuspidate apex of the leaf. *Quercus pontica*, a very handsome large-leaved oak from Lazistan, I was glad to see, also the true *Pterocarya rhoifolia*. An interesting fir is *Abies insignis*, a presumed hybrid between *A. Pinsapo* and *A. Nordmanniana*. The nursery is very rich in coloured-leaved and other varieties of maple; amongst them *Acer platanoides*, var. *Walderseei*, a Norway maple, whose leaves are so densely speckled with white dots as to give them a delicate grey appearance, was one of the most noticeable in June. A splendid tree of the typical "Box elder" (*Acer Negundo*) is 60 ft. high and 6 ft. 6 in. in girth of trunk. *Populus berolinensis*, a useful semi-fastigiate tree is here in quantity; it is an interesting hybrid between *P. laurifolia* and the Lombardy poplar. A notable culture in this nursery is the big standard rose. A plant of one variety "Madame Sancy de Parabère," loaded with flowers, measured 10 ft. high by 8 ft. through.

Sans Souci. June 10.

The Royal Gardens attached to the old chateau of Sans Souci are certainly as interesting and beautiful as any I saw, either in Germany or Austria Although a considerable space is given up to purely formal arrangements, the Versailles influence has not, as at Schönbrunn and Herrenhausen, been allowed to overlay the whole place. The chateau itself stands on an eminence, and is approached by a long and imposing series of flights of steps. The hillside has been terraced, and the supporting walls of the terraces are covered with glass, and are used for the cultivation of the less hardy fruits. The terraces themselves are also utilised for the cultivation of fruit trees and vegetables.

The level ground at the base of the hill is furnished with a varied and very interesting sylvan growth. Many of the trees are finely developed. *Tilia argentea*, for instance, is at least 80 ft. high, and there are a pair of fine maidenhair trees (*Ginkgo biloba*). *Cercidophyllum japonicum* is 25 ft. high—a picture of health and

elegance. A striking and somewhat unusual effect was made by planting purple beech and the variegated *Acer Negundo* so close together that the foliage of the two trees commingled. The restrictions compelling visitors to keep to the paths are, as in other German public gardens, strictly enforced and prevent a close inspection of the trees and shrubs.

The purely formal arrangements at Sans Souci are often very pleasing. They do not depress one by their extent and dullness as at Herrenhausen. In one place there is a small garden of azaleas disposed in formal beds cut out on the lawn and surrounded by large clipped yews ; this must be a very pleasant spot when the azaleas are in blossom. In another place a circular flower garden of "geometric" beds is surrounded by a raised terrace, and the terrace is traversed by a plashed alley of hornbeams. In the "walls" of the alley, windows are left through which views of the flower garden, with its central statue of Apollo are obtained. The sloping banks of the terrace are clothed with a luxuriant growth of ferns. These and other features of a similar nature are dispersed amidst the sylvan growth of the place. Although they are somewhat foreign to the gardening taste which has prevailed in England for a generation or more, they have a certain quaintness and charm. Like so many gardens of its period and character, Sans Souci is liberally besprinkled with statues and grottoes, and there are several water-basins and other forms of masonry. One leaves Sans Souci with a desire to see it again.

The distance between the gardens of Sans Souci and the newer palace of Potsdam is filled with woodland of somewhat the same character as the Thier Garten outside the Brandenburg Gate. Owing to the Imperial Family being in residence, it was not possible to obtain a close view of the Schloss and its immediate surroundings.

Dresden Botanic Garden. June 11.

Few cities give the stranger a more pleasing first impression than Dresden, and this feeling is not, as so frequently happens on the Continent, dispelled when the Botanic Garden of the place is entered. The Botanic Garden of Dresden, though not large, is admirably managed, and is a worthy accompaniment to the fine streets, churches, public buildings, and galleries of the city.

The trees and shrubs I found particularly interesting, the collection being varied and extensive, and many of the individual specimens finely developed. It is not often one meets with so many uncommon trees and shrubs in so small a space, and in so characteristic a condition. The garden is not large enough to grow everything, so, very wisely, preference is given to the rarer and more beautiful species. On the other hand valuable space is given up to a geographical arrangement. This, as has already been noted, is a popular arrangement in Continental gardens. Often the hardy trees and shrubs are augmented by a huddled mass of plants in pots representing the flora of the Cape, or Australia, or the Canary Islands. I was never able to perceive its value unless done on a grand scale, as it is at Tervueren, near Brussels. Where there is insufficient room for a complete collection arranged

systematically, it seems to be a waste of space to duplicate such trees as there is room for under a geographical arrangement. It seems absurd to expect to reproduce the characteristic features of (say) the Californian sylva on a plot not many yards square in the middle of Europe. And for purposes of comparison and the solution of problems of identity, it is surely more convenient to have the representatives of a genus in close proximity rather than the representatives of a country generally.

Magnolias thrive exceedingly well at Dresden. A plant of *M. stellata* 10 ft. high and 15 ft. through must be a wonderful picture when in flower. There is also a very handsome specimen of the comparatively new and uncommon *M. hypoleuca*; it is 17 ft. high, the branches rather erect, and the habit pyramidal.—Of the large trees, *Populus trichocarpa* was perhaps most noteworthy; this species is allied to the balsam poplar, but comes from Western North America. Although not very long known in England, it is already 70 to 80 ft. high in this garden, and its trunk girths 5 ft. 10 in. *Quercus bicolor*, one of the American white oaks which do not thrive well in England, is here 50 ft. high, very healthy, with a trunk 3 ft. 4 in. in girth. Other interesting oaks are the American *Q. stellata* (or *Q. obtusiloba*), 25 ft. high, and *Q. pontica*. *Larix occidentalis* is 25 ft. high, but conifers generally are not good. Among the shrubs, *Fendlera rupicola*, which is not really hardy at Kew, is 6 ft. high at Dresden; *Cornus alternifolia*, a very elegant and distinct species is 15 ft. high and 12 ft. through; *Styrax japonica* 12 ft. high, flowering well; and *Menziesia globularis* 5 ft. high. Three dwarf shrubs were very charming: *Loiseleuria procumbens*, *Epigaea repens*, and *Oxycoccus macrocarpus*, all growing in soft spongy peat in full sunshine.

There is a small well-furnished rockery on which many Alpine plants are thriving admirably, and the herbaceous plants generally are good.

Grosse Garten, Dresden. June 11.

A short tram ride from the Botanic Garden will take the visitor to the Grosse Garten, which will well repay the journey. This demesne surrounds an ancient and beautiful house, once a royal residence, but now a museum. A considerable portion of the grounds are covered with beautiful woodland, intersected by straight avenues and winding paths. But near the house is a flower garden, formally laid out, and containing on its borders some fine trees. There is a *Gymnocladus canadensis*, not quite so fine as the one at Herrenhausen, but girthing 6 ft. 3 in.; there is one of the finest specimens of *Gleditschia triacanthos* in Germany—a tree with an enormous spreading head of elegant foliage, supported by a trunk over 7 ft. in circumference; and there are a weeping copper beech 40 ft. high, a fine golden oak (*Quercus pedunculata*, var. *Concordia*) nearly as tall, and a *Tilia cordata* branching close to the ground where the trunk is about 8 ft. through. In a shady opening into the woods was a most pleasing arrangement of rhododendrons, a spot which may in time suggest the Rhododendron dell at Kew. A good use here, as in Berlin, is made of the Rouen lilac grown as standards. They make rounded

bushy heads 8 or 9 ft. through, supported on stems 4 to 5 ft. high and 20 in. or so in girth. Returning towards the town by another route, one may traverse the banks of the Carola see, a charming lake with undulating, curving banks, and a prettily disposed marginal vegetation, amongst which the silvery-leaved *Elaeagnus orientalis* was a most telling feature in June, surpassing any willow in whiteness.

The journey on to Prague was taken in the evening.

Prague. June 12.

There is not much of unusual interest to the botanist and connoisseur of trees in Prague, but before going on to Vienna I paid a visit to the chief open space of the city, the Karls Platz. The grounds here are very pleasant, with lawn and trees disposed informally. Although considerably south of Berlin the trees used are the same as those common in the gardens of North Germany and Britain, and planters rely on such things as oaks, *Ailanthus*, black walnut, elms, *Robinia* and the like. To the foreigner, the chief object of interest in the Karls Platz is a statue of Benedict Roezl, the famous plant-collecter in Mexico and Tropical South America. He was born in 1824, and died at Prague in 1885, He is here vigorously portrayed in collector's costume, examining an orchid flower. One would search in vain the public gardens and open spaces of this country for a statue of any plant collector. Yet it is easy to recall the names of at least half-a-dozen men—some of them Kew men—who have as great a claim to the gratitude and remembrance of posterity as Benedict Roezl.

Vienna Botanic Garden. June 13.

The Botanic Garden of Vienna, which is really an adjunct to the University, is now deeply buried in streets and houses. Although cramped for room like so many of its class, it contains many features of interest. There are two fine female specimens of the maidenhair tree with the characteristic pendulous branches. Near the entrance from the Renneweg are a fine *Ulmus glabra* and a magnificent *Platanus acerifolia*. The garden also contains two other notable planes—the true *P. orientalis* and *P. orientalis*, var. *insularis*, the latter with very deeply-lobed leaves. The Kentucky coffee tree (*Gymnocladus canadensis*), which I found so splendidly developed in many other gardens of Central Europe, is represented here by several good trees. The true *Gleditschia caspica* of Desfontaine, a tree with large oblong leaflets, and quite distinct from the form of *G. triacanthos* frequently found under that name, is here a low-branching unarmed tree, with a trunk nearly 8 ft. in girth at the base.

Many of the trees in the Vienna gardens showed the influence of a hot summer climate by their fine development, which was not so apparent at Berlin or even as far south as Prague. Thus. *Cladrastis tinctoria* (of which there is a good specimen) had flowered with great freedom, which at Kew happens scarcely once in a decade. *Pterocarya caucasica*, a large spreading tree with

numerous trunks, made a picture of great beauty, every branch being hung with the slender graceful racemes, about a foot in length. *Paulownia imperialis*, too, showed that it revelled in the heat of a Viennese summer; one specimen has a trunk 7 ft. 6 in. in girth. *Cydonia sinensis*, which at Kew requires to be grown against a wall to succeed really well, is, in this garden, a tree 15 ft. high, with a striking trunk, the bark of which peels off like that of a plane. *Vitex Agnus-Castus* makes a bush 10 ft. high and 15 feet through. *Celtis Tournefortii*, a tree rare in England, with rather grey or glaucous foliage, cordate, and coarsely toothed, was noticeable for its hornbeam-like trunk. I was interested to see for the first time in flower the true *Schizophragma hydrangeoides*; this is the Japanese creeper for which *Hydrangea scandens* is so often made to do duty.

An interesting feature of the garden is a series of small plots devoted to common and uncommon economic plants, vegetables, medicinal herbs, cereals, etc. This has a distinct educational value. On the whole the outdoor department of the Botanic Garden at Vienna is ably managed, considering the disadvantages as regards locality and want of space that have to be contended with. A rock garden of a somewhat puerile character and the usual needless geographical groups are the only things open to criticism.

Schönbrunn. June 14.

The Imperial residence of Schönbrunn and the famous gardens attached to it are about three miles from the centre of Vienna, and easily reached by electric tram. The influence of Le Notre and his *chef d'œuvre* at Versailles, which is manifest in so many large gardens of the Continent, is nowhere more in evidence than at Schönbrunn. Originally designed by Fischer von Erlach at the end of the 17th century, the main features of the gardens have apparently been but little altered since. Immediately in front of the Palace is a flat, open parterre extending to the base of a hill; the slopes of this hill have been partly terraced, and its summit is crowned by the conspicuous colonnade called the "Gloriette." The parterre is occupied by beds cut out on the turf, and filled with the usual summer bedding plants—pelargoniums, tuberous begonias and the like.

The chief features of Schönbrunn are its long, straight walks and avenues bordered by clipped hedges. Some of these hedges are 30 to 50 ft. high, and must represent an enormous expenditure in labour. The trees in commonest use are the field maple (*Acer campestre*) and hornbeam, and, judging by the size of the trunks of many of those that border the parterre, they must date back to Fischer's time. They are really big trees, with one side converted into a perpendicular wall of verdure by persistent pruning. Some of them show signs of rebellion, and a good many holes are appearing in these walls. Thus, the effect, which is imposing to the first view, is spoilt by a closer examination. Of gardening in the true sense there is but little.

Among the architectural features of Schönbrunn, besides the Palace itself, the most striking is the "Gloriette," which, situated on a hill nearly 800 ft. high, gives a fine view of Vienna and the

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surrounding country. The Neptune basin at the base of the hill is a large and ornamental tank with a fountain at each end and a fine group of statuary in the centre—Neptune with Tritons and sea-horses. There are also some elaborate Roman ruins (artificial), and a lofty obelisk terminating one of the avenues and built on a kind of rockwork in which are "planted" some Agaves, palms, etc., done in metal! A large portion of the grounds at Schönbrunn is thickly wooded. In the lower-lying areas they form part of the garden design and are trimmed more or less, but on the hillsides east and west of the "Gloriette" are some fine natural woods in which the prevailing oak is a form of *Quercus sessiliflora* with very rugged bark. The Schönbrunn gardens are open to the public every day, and these shady portions are favourite resorts of the Viennese. On Sunday, June 14, I found the place thronged with people soon after 9 a.m.

Schönbrunn Botanic Garden. June 14.

Whilst the garden proper of Schönbrunn is decidedly worth visiting as representing a really extraordinary example of its particular style, its monotony soon becomes wearisome. Some of its walks are $\frac{3}{4}$ to 1 mile long—deserts of gravel. But on its western side there is a narrow strip of ground, called the Botanic Garden, which is full of interest. This garden is said to have been instituted by the Emperor Francis I. in 1753. It possesses, indeed, the dignity of age, and its magnificent trees, green lawns, and winding walks are an inviting contrast to the arid formalities close by. There is a fine Palm house of a design somewhat similar to that of Kew, but with more architectural ornamentation; on the day of my visit 1 krone (10d.) was charged for admission. The collection of Australian and other greenhouse plants is very extensive.

To the English visitor there is, perhaps, no tree so striking in the neighbourhood of Vienna as *Pterocarya caucasica*; in this garden there was a very fine specimen clothed with innumerable elegant pendent racemes. A striking tree also is a small-leaved form of *Ulmus campestris*, here called *U. angustifolia*, with a handsome well-balanced head supported on a trunk $13\frac{1}{2}$ ft. in girth, and very elegant with its slender feathery twigs. A specimen of the American white ash (*Fraxinus americana*) has a trunk 7 ft. in circumference. I was struck by the fine development of *Corylus Colurna* at Herrenhausen, but the tree there is surpassed by those at Schönbrunn. One I measured has a trunk girthing 10 ft. 3 in. at one foot from the ground where it divides into five great limbs. This tree is probably 65 ft. high. *Sophora japonica* is represented by a splendid old specimen; its trunk branches low and not far from the ground level measures 18 ft. in girth; and the branches, some of which rest on the ground and have taken root, cover a space 105 ft. across. This tree appeared to be from 70 to 80 ft. high. A handsome tree of *Gleditschia caspica* is 40 ft. high, and the cut-leaved variety of the Norway maple (*Acer platanoides*, var. *laciniatum*) is here as elegant in its foliage as some forms of *Acer japonicum*. *Prunus triloba fl. pl.* is highly prized in England for its masses of large rose-tinted double flowers, but I have not seen so fine an example anywhere as one in this garden

at Schönbrunn, which was grafted on a standard and had a large bushy head 10 ft. high and a main stem more than 1 ft. in girth. The use of flowering shrubs grown as big standards is much more common on the Continent than with us. These are but a few of the more notable trees I saw in this pleasant corner of Schönbrunn.

Other Parks and Gardens of Vienna.

The remainder of my time in Vienna was spent in seeing various gardens and parks about the city; of these the three briefly noted below were the most important. The Stadt park is not large, but is well designed and managed. It contains a huge spreading specimen of *Pterocarya caucasica*, the finest among the many fine ones I saw in this neighbourhood. There are also some good fastigiate oaks, trees of a Lombardy poplar-like growth, not sufficiently appreciated in Great Britain. *Elaeagnus orientalis*, a silvery-leaved tree much planted in Central Europe, was very good here; one tree had a trunk 4 ft. 8 in. in girth. This small tree (sometimes a shrub) is not much planted in England, but, no doubt, the whiteness of the leaf is more pronounced under the Continental sun than beneath our duller skies. In Germany and Austria its effect is something like that of the whitest form of *Salix alba*, but even more intensely silvery.

The Prater, an island in the Danube, is the largest public park of Vienna, and a popular pleasure resort of the Viennese. Through it runs a straight avenue—the Haupt-Allee—$2\frac{3}{4}$ miles in length, bordered largely by horse chestnut trees. At each side of this noble avenue—the Rotten Row of Vienna—are woodland and grassland. Some of the former is interesting as being the remnants of an ancient natural forest, consisting of oaks and other trees. It was a favourite hunting-ground of the Austrian Emperors of the 16th and 17th centuries.

The Belvedere gardens are close to the Botanic Garden of the University. They consist of a long rectangular area, sloping upwards from the Renneweg to the Belvedere Chateau. They are laid out in a purely formal style, and the slope is partially terraced. The chief features of interest here are the well-kept clipped hedges of field maple 12 ft. high; clipped yews of sugar-loaf shape; and low, square box hedges. There are also circular basins of water, ornamented with groups of statuary. Of naturally grown trees there were none, and but few flowers. On the south side of the chateau (a handsome structure built about 200 years ago for the Prince Eugene of Savoy) are other gardens, but they were not open to the public.

Ischl. June 16 and 17.

This beautiful little town, situated among the North Austrian Alps, and now well known as the summer residence of the Emperor of Austria, and a fashionable bathing place, is the centre of a great forest region owned and controlled by the Austrian Government. It was to see these forests, and gain such information as to their management as a two days' sojourn would permit, that a visit was made to Ischl. The whole district is under the direction of a "forest-master"—a position of some importance

and authority. Through the good offices of Professor von Lorenz of Vienna, the "forest-master" kindly furnished me with a guide for the two excursions I made into the forests.

So far as one is able to judge from the railways, the forests of the great plain of Hanover and Prussia are chiefly made up of the Scotch pine (*Pinus sylvestris*). Turning south from Berlin to Dresden the same tree predominates until Dresden is reached. But thence to Prague and Vienna, the spruce (*Picea excelsa*) and the silver fir (*Abies pectinata*) begin to prevail, and here at Ischl the Scotch pine plays but an unimportant part. The two trees of greatest importance are the common spruce and silver fir; then comes the larch, whose timber is more valued than that of either. No species of broad-leaved tree is of much importance in these mountain forests with the exception of the beech, of which some fine areas exist at the lower elevations. The Emperor has hunting rights, and some of the inhabitants of Ischl have certain heritable privileges in regard to cutting timber for their own use. With these exceptions the forests are entirely utilised and preserved for purposes of State revenue.

The forests are all natural, and they are replenished almost wholly by natural means. The timber is appropriated sometimes piecemeal, but sometimes whole sections are cleared at once. The ordinary forest is dense enough to prevent the growth of young seedling trees, and therefore very few of sizes intermediate between the big timber trees and tiny seedlings are to be seen. When a section is fit for cutting, trees are felled to admit sufficient air and light for the natural young forest growth to establish itself, which is always there waiting for its opportunity. But the section is not entirely cleared of old trees until this young forest growth is at least 3 ft. high. When a section is cleared entirely it is planted up again in the ordinary way, and the useful plan is adopted of establishing a small nursery of sufficient young trees for the purpose in proximity to the clearing.

But, on the whole, these forests are in no sense "man-made." They are regarded as natural reservoirs of timber from which the aim is to draw off every year a year's natural increment. The age of the trees fit to be cut varies according to the fertility of the ground and the elevation at which they grow, but I was told that the finer trees are 200 years old. Some such trees (silver firs) I measured were 130 ft. long and 10 ft. in girth. The timber most valued is the larch, which grows on the higher elevations; after that comes the spruce, and, thirdly, the silver fir. All three are genuine natives of the district. Besides supplying the local demand for fuel and building these timbers are largely exported into Germany.

Most of these trees grow on the shelves and steep slopes of the mountain sides, quite inaccessible to ordinary means of traffic. The transference of the timber from the high elevations to the valleys is effected by means of "timber-slides." A timber-slide is a sort of trough, one metre wide, extending in two or three sections from a depôt on the heights to another in the valley, where the timber can be put on bullock wagons and thence on rail. The sides are formed of whole trunks of silver fir laid end to end, usually singly. But in places where the "slide" takes a

curve the outer side of the curve has two tree-trunks laid one above the other to counteract the centrifugal tendency of the timber rushing down the "slide." The track, or bottom, of the slide is laid with crosspieces of beech, which are about 2 ft. 6 in. apart. Where the "slide" takes a curve the track is sloped inwards on the same principle, and for the same reason, as is a railway track in similar circumstances. The fall of the "slide" follows pretty much the face of the mountain side, but occasionally it has to be bridged over gorges and watercourses, and sometimes "cuttings" have to be made through ridges. The "slide" I inspected was in some places only 20 per cent. out of the perpendicular—equal to an angle of 72 degrees. In such places the enormous trunks fly down with a tremendous velocity. In other places the fall of one section of the slide is so gentle that it is only used in wet weather when the track is kept slippery by rain. Thus are these enormous tree trunks transferred from the mountain plateau to the valleys. They are dispatched with the thick end of the trunk first, and this is slightly sharpened or rounded to reduce the risk of its being impeded by the sides of the track. And for the same reason the trunks are, of course, carefully trimmed before they are sent off. This timber-slide cost 40,000 kronen (about £1,650) to construct without counting the value of the timber used, which was mostly on the spot.

The woodmen—an admirable type—live in these forests all the year round, only going home to their villages from Saturday night until Monday morning. Through the week they live, a dozen or so together, in commodious wooden houses built of logs of timber. They sleep on broad shelves liberally supplied with straw, and each man has his private locker. During the week their food consists almost entirely of the grey rye-bread of the district. Their costume is a short jacket, a serviceable pair of leather breeches cut to well above the knee, and leggings not reaching to the knee, which is thus left bare.

The English Garden at Munich. June 19.

The "English Garden" at Munich is one of the most noted public gardens in Germany; at one time it was (and, perhaps, now is) the largest—containing about 500 acres. The chief essential of these so-called English Gardens of the Continent appears to be that they must not contain a straight line of any sort. No doubt they represented a very necessary revulsion against the school of Le Notre, but they erred as much in another direction. This English Garden at Munich was designed in 1789 by a famous man of his time—Louis Sckell—and appears to have long been considered an admirable piece of work. No doubt it affords the people of Munich an abundance of shady walks and promenades, but of genuine landscape effects there are few. It is well supplied with water by means of a stream which flows through it, and in one place this is very happily used to make a waterfall. It also feeds a lake of considerable size, which gives some pretty prospects and a welcome distance of view. The great need of this "garden" is one or two broad straight avenues to give some sense of space and distance, for the place is heavily wooded, and, except for the lake and a few stretches of hay-land, one's outlook is very

restricted. The predominant impression with which one leaves the English Garden at Munich is that it is a labyrinth of walks and roads hemmed in by tall slender trees, which ought long ago to have been thinned, and that it goes a long way to justify the sarcasm levelled by a Frenchman at the path-making of so-called "English Gardens" in general: "You intoxicate your gardener, and then mark out his tracks."

The Nursery of Messrs. Lemoine, Nancy. June 20.

In travelling from Munich to Paris, the train passes through Nancy, and advantage of this was taken to visit the renowned nursery of Messrs. Lemoine et Fils. For many years this nursery has been famous for a remarkable series of hybrid plants produced in it. M. Lemoine the elder, now an octagenarian, but still busy and active, has a wonderful faculty—it really amounts to genius—for estimating and bringing out the qualities of a plant for breeding purposes. The acme of success in hybridising is to unite in the progeny of two species the good qualities of both, and to eliminate their undesirableness. No one living has achieved more in this direction than M. Lemoine. Two instances may be given: The Begonia "Gloire de Lorraine" gave to greenhouses a new and most useful plant of beauty and distinction; and *Philadelphus Lemoinei* was the first of a beautiful race of hardy shrubs quite distinct from anything we had before. A man's fame might securely rest on these two plants alone, but a great work also has been done in this nursery among lilacs, deutzias, clematis, gladioli, and many more.

Messrs. Lemoine also make a speciality of new and rare plants, both hardy and tender. A visit paid to this nursery, therefore, is full of interest and instruction, especially to anyone on the look-out for new and out-of-the-way plants. A mere list of such plants would be too long to give here, and many of the new hybrids I saw are not yet put in commerce or even named.

Verrières-le-Buisson. June 22.

Verrières is famous as the central establishment of the great firm of Vilmorin-Andrieux et Cie., which dates back to 1746. It is also the home of the head of the firm, M. Philippe L. de Vilmorin, and its chief interest to me was in the fine collection of trees which grow in the large garden attached to the house. The property here, originally a French park laid out by Le Notre, was purchased by the then head of the firm in 1815, and several of the fine trees which now ornament its lawns were planted between 1815 and 1820. Many others are interesting as belonging to the first importations of their kind ever made into France. The garden is a charming example of its particular style—a style the very antithesis of that of Le Notre which it displaced. Smooth and gently undulating lawns are bordered by the fine trees, now a century old, and there are winding shady walks. One of the last features added to the garden is a beautiful rock garden made by the present proprietor. The firm of Vilmorin-Andrieux are the greatest seed merchants in the world, and do their work on a grand scale. Attached to Verrières is a large laboratory, in charge of a chemist, and also an extensive museum.

In some respects the two most interesting trees at Verrières are hybrids: *Juglans Vilmoriniana* and *Abies Vilmorini*. The first of these is of unrecorded origin, but is certainly a hybrid between the common and the black walnuts. It was planted in 1816, and is now a splendid tree over 90 ft. high. Its finely-shaped trunk is 10 ft. 2 in. in girth. The hybrid fir is of even greater interest. The cross was made here in 1867 by the late M. Henri de Vilmorin, between *A. cephalonica* and *A. Pinsapo*, and from the solitary seed produced, this tree, now 50 ft. high, was raised. Both in foliage and in habit the tree resembles *A. Pinsapo* (the seed-bearer) but its cones are more like those of *A. cephalonica*. These cones are produced abundantly, and carry fertile seed from which young trees have been raised; some of these seedlings more closely resemble the male parent in foliage. So far as is generally known this is the only hybrid conifer ever raised artificially. There is a tree of the rare *Larix occidentalis* about the size of the Kew specimens; like them, it produces an abundance of cones, none of which ever contain any fertile seed. This may be due to the comparative juvenility of the trees, but it is not favourable to the hopes entertained in regard to this tree that it may eventually fill to some extent the place now occupied by the common larch in English forestry.

One of the finest examples of *Pseudolarix Fortunei* in France is 33 ft. high and 3 ft. in girth of trunk. Two of the noblest trees of the garden are specimens of Corsican pine (*Pinus Laricio*); they are about 90 ft. high with smooth, erect, columnar trunks. Two large cedars of Lebanon do much to give this garden the air of distinction which it enjoys. A tree I had not seen before was a fastigiate variety of the white mulberry. Of some good oaks the best are *Quercus lanuginosa*, 70 ft. high; *Q. heterophylla* (carrying mistletoe) 73 ft. high; *Q. bicolor*, 5 ft. 4 in. in girth of trunk; and *Q. palustris*, 70 ft. high and 6 ft. 6 in. in girth. Besides all these, the garden contains many rare and beautiful shrubs and herbaceous plants.

Les Barres. June 23 and 24.

To anyone interested in new and rare shrubs the most interesting place on the Continent at the present time is the fruticetum in process of formation by M. Maurice L. de Vilmorin at Les Barres. M. de Vilmorin has been in close relationship with travellers, chiefly missionaries, in China for many years past, and having received from them seeds of many species previously unknown in Europe, he has been able to get together a collection quite unique in the richness of its Chinese representatives. Over sixty years ago the grandfather of the present proprietor planted large areas of trees at Les Barres under forest conditions, with a view to testing their value in French forestry. These plantations, which consist of a considerable variety of both Old and New World trees, planted in large blocks (*massifs*) of a single species or variety, are now of considerable interest and value. They have been acquired by the French State, and Les Barres has become an important educational centre as regards French forestry. A botanical collection of trees has also been established in connection with the forestry school, and to this M. de Vilmorin's magnificent

collection of shrubs will form a valuable adjunct. Already many of his rare plants have been given to nurserymen and amateurs and have thus found their way into many European gardens.

Although the richness of its Chinese species is its most striking feature, the fruticetum at Les Barres is planned to include a comprehensive collection of shrubs that are hardy there, whether European, Asiatic or American. In the arrangement of the Natural Orders and genera, the *Genera Plantarum* of Bentham and Hooker is largely followed. Where the collection is not yet complete, space has been left for the additions as they are obtained. This plan is a wise one, for although it involves the existence of temporary bare spots, it enables a plant to be put in its appointed place once and for all, and avoids the loss and trouble attendant on repeated transplanting where immediate effects are sought.

Davidia involucrata is now, through the enterprise of Messrs. Veitch, plentiful in Europe, but it existed at Les Barres for some years before Messrs. Veitch obtained it in quantity from China. The original plant, which is in M. de Vilmorin's private garden, flowered for the first time in 1907. It has flowered again this year, and is now carrying the first fruits ever produced in Europe. These are borne singly on slender stalks, about 4 in. long, and in June were small, pear-shaped, and about $\frac{3}{4}$ in. long.

Among the numerous Chinese roses, a great variety of *R. sericea* forms are perhaps the most interesting. The most striking of these, *R. sericea*, var. *pteracantha*, is notable for its long, flat, translucent, rich red spines. M. de Vilmorin has also many distinct forms of *R. macrophylla* and *R. moschata*.

Many new cotoneasters have found their way into gardens through Les Barres, and there are several others of great promise as yet unnamed. The charming and distinct *C. adpressa*, a low, very dense bush, here covers a space 9 ft. across. *Platycarya strobilacea*, a rare and curious ally of the walnuts, was in blossom; the flowers are greenish white and are borne in large panicles. An unnamed species of *Bauhinia* promises to be hardy, and if so will add quite a new and distinct type to our hardy shrubs.

Pteroceltis Tatarinovi is an ally of the nettle-trees (*Celtis*); it has curious winged fruits and is here 30 ft. high. A true nettle-tree (*Celtis heterophylla*) with leaves strangely diverse in shape, is quite distinct from any species previously in cultivation. *Marlea platanifolia*, 12 ft. high, was carrying numerous long white flowers. *Gymnocladus chinensis* is an interesting Asiatic representative of a genus long thought to be exclusively American. *Zelkowa Davidiana* is a new addition to a small and interesting genus. *Æsculus indica*, the Himalayan horse-chestnut, was flowering freely. The new *Ailanthus Vilmorini*, from China, with its curious spiny branches, is represented here by the parent tree of all the plants at present in Europe. These are but a few of the rare and remarkable things to be seen at Les Barres. Very many more exist there, as yet without names, and under numbers only.

XLIX.—DIAGNOSES AFRICANAE: XXV.

971. **Mesembryanthemum acutipetalum**, *N. E. Brown* [Ficoideae-Mesembryeae]; affine *M. diminuto*, Haw., sed foliis brevioribus erectioribus pedunculo brevissimo et petalis acutis facile distinguitur.

Herba perennis, acaulis, multiceps, glabra, radice longa crassa lignosa. *Rami* numerosi, compacti, brevissimi, 0·5-2 cm. longi, foliis 2-4 et vestigiis confertis foliorum delapsorum vestiti. *Folia* erecta, 1·3-3 cm. longa, 5 mm. lata, 4 mm. crassa, semiteretia, dorso carinata, acuta, apiculata, laevia, vix glaucescentia, multipunctata. *Pedunculi* 5-8 mm. longi. *Sepala* latissime ovata vel subrotundata, acuta vel obtusa, membranaceo-marginata punctata. *Petala* numerosissima, 1·5 cm. longa, 0·7 mm. lata, angustissime linearia, acuta, roseo-purpurea. *Stamina* indefinita, patentia. *Styli* 7-8.

South Africa. Transvaal; near Johannesburg, *Turner*.

972. **Mesembryanthemum sexpartitum**, *N. E. Brown* [Ficoideae]; affine *M. Lehmanni*, Ecklon, sed foliis longioribus floribus sessilibus et sepalis 6 facile distinguitur.

Planta succulenta, humilis, circa 8 cm. alta, dense ramosa. *Rami* 2·5-7·5 cm. longi, adscendentes vel procumbentes, basi lignosi. *Folia* confertissima vel in ramis florentibus 0·5-2 cm. distantia, 2-5 cm. longa, 5 mm. crassa et lata, subacute trigona, acuta, basi breviter connata, glabra, impunctata, laevia, glauco-viridia. *Flores* terminales, solitarii, sessiles. *Sepala* 6, inaequalia, 10-12 mm. longa, erecta, trigona, acuta, basi anguste membranaceo-marginata. *Petala* 5-6—seriata, pallide flavo-albida; exteriora 1·7-2 cm. longa, 1·5-2 mm. lata, linearia, acuta vel subobtusa; interiora gradatim minora. *Stamina* numerosa, patentia, exteriora vel staminodia ananthera subpetaloidea. *Filamenta* et staminodia alba, apice lutea. *Antherae* albescentes. *Styli* 6, staminibus breviores, patentes, acuti.

South Africa. Karoo, *Pillans*. Flowered at Kew in September, 1908.

973. **Rauwolfia oxyphylla**, *Stapf* [Apocynaceae]; affinis *R. macrophyllae*, Stapf, sed foliis acutissime acuminatis longiuscule petiolatis substantia magis herbacea nervis magis obliquis et curvatis, floribus paulo majoribus distincta.

Arbor 9-18 m. alta, glaberrima; ramuli crassiusculi, 4-angulati, nigrescentes, vetustiores subteretes. *Folia* verticillata, quaternata, oblanceolata, saepe tenuiter acutissime acuminata, basi longe cuneata, 15-18 cm. longa, 4-7 cm. lata, membranacea, nervis lateralibus utrinque ultra 20 oblique patulis prorsus curvatis, venis obscure reticulantibus; petioli 2-3 cm. longi. *Cymae* densae in radiis secundariis vel tertiariis umbellae 10 cm. diametro dispositae; pedunculus 3-5 cm. longus; radii primarii 4-5 cm. longi, 3-6-ni, cymigeri 2-0·5 longi, 6-9-ni; pedicelli breves vel brevissimi, maturitate raro 2 mm. attingentes. *Calyx* 1·25-1·5 mm. longus, segmentis e basi ovata vel triangulari acuminatis basi haud obtegentibus. *Corollae* tubus 4-4·5 mm. longus; lobi late ovati,

obtusi, 0·75 mm. longi ; fauces villosae. *Stylus* cum stigmate 3 mm. longus, glaber. *Drupa* globosa vel subglobosa, interdum magis minusve cordata, 7-9 mm. diametro ; pyrenae 2.

UGANDA. Bugoma, in woods, *Dawe*, 711 ; plains below Ruwenzori, 900 m., *Dawe*, 603.

Evidently closely allied to *R. macrophylla*, which has so far been observed only in the Cameroons and the island of S. Thomas (*Ribeiro*, No. 2).

974. **Cryptolepis linearis**, *N. E. Brown* [Asclepiadaceae] ; species ab omnibus foliis linearibus et cymis terminalibus congestis subcapitatis distinctissima.

Fruticulus ramosus. *Rami* graciles, minutissime scaberulo-tuberculati, rufescentes. *Folia* opposita, patula, 3·5-7 cm. longa, 1·5-3 mm. lata, linearia, acuta, basi cuneata vel subrotundata, plana vel marginibus revoluta, vix petiolata, utrinque glabra. *Flores* in cymam 20-30-floram terminalem capituliformem congestae. *Bracteolae* numerosae, 1·5 mm. longae, 0·75 mm. latae, ovatae, obtusae, glabrae, apice minutissime ciliatae. *Sepala* 1·75-2 mm. longa 1·5 mm. lata, ovata, obtusa, glabra, apice minutissime ciliata. *Corolla* glabra ; tubus 2·5 mm. longus, campanulatus ; lobi 2·5 mm. longi, 1·5 mm. lati, oblongi vel ovato-oblongi, obtusi ; sacculi ad sinus truncati, minute bidentati. *Coronae lobi* clavati, horizontaliter porrecti.

ANGOLA. Ulondo Mountains, 1360 m. alt., *Wellman*, 1785.

975. **Ceropegia Wellmanii**, *N. E. Brown* [Asclepiadaceae] ; affinis *C. umbraticolae*, K. Schum., foliis cordato-ovatis glabris et floribus minoribus distinctissima.

Herba erecta 20 cm. vel ultra alta, caule inferne compresso, glabro, superne parce puberulo. *Folia* patentia vel deflexa ; petiolus 7-10 mm. longus, puberulus ; lamina 3-4·5 cm. longa, 1·3-2·5 cm. lata, elongato-ovata vel latissime ovata, acuta vel obtusa et minute apiculata, basi cordata, utrinque glabra, nervis subtus minute et parce puberulis, minutissime ciliata. *Flores* ad nodos bini. *Pedicelli* 1 cm. longi, minutissime puberuli. *Sepala* 5-6 mm. longa, lanceolato-attenuata, apice recurva, parce et minutissime puberula. *Corollae* tubus 2·2 (vel ultra ?) cm. longus, fere 1 cm. diametro, subcylindricus, superne levissime angustatus, inferne glaber, virescens, prope apicem microscopice et parce puberulus, purpurascens ; lobi apice connati, 2·2 cm. (vel ultra) longi, e basi deltoideo anguste lineares, replicati, marginibus undulatis, dorso minutissime puberuli, intra glabri, atropurpurei. *Corona exterior* cupularis, 10-dentata, dentibus 4 mm. longis erectis linearibus obtusis longe-ciliatis, basi paribus breviter connatis cum denticulo minuto inter iis munitis. *Coronae interioris* lobi 1 mm. longi, antheris arcte incumbentes et breviores, dorso partitionibus coronae exteriori connexi.

ANGOLA. Ulondo Mountains, 1360 m. alt., *Wellman*, 1781.

976. **Euphorbia** (§ **Tirucalli**) **implexa**, *Stapf* [Euphorbiaceae] ; affinis *E. Bottae*, Boiss. et *E. Schimperi*, Presl, sed dumos densissimos formans, ramis longis vel erectis vel patulis vel pendulis quaquaversus implicatis junioribus superne longe (ad vel

ultra 40 cm.) indivisis; ab *E. Schimperi* etiam cyathiis longius pedunculatis recedit.

Frutex humilis, vix metralis, dumosus, glaberrimus; rami teretes, glaucescentes, longi, vel erecti vel patuli vel penduli, quaquaversus densissime implicati, juniores superne longe (ad vel ultra 40 cm.) indivisi, vetustiores ramos secundarios recto angulo patentes emittentes. *Folia* ramorum sterilium numerosa, lanceolata, acuta, 1–1·5 cm. longa, 2–3 cm. lata, declinata, mox delabentia, cicatrices anguste semilunares desinentia, ramorum florentium superiora multo latiora, elliptica, summa umbellam cingentia rhomboideo-rotundata, apiculata, 0·5–0·6 mm. longa. *Umbellae* terminales, radiis 4–6, centrali 3–4 mm., caeteris ad 12 mm. longis. *Cyathium* centrale ☿, ebracteatum, 8 mm. diametro, lateralia ♂, bracteis 2 rotundatis obtusis latioribus quam longis suffulta, 5 mm. diametro. *Involucrum* 5–lobatum (vel in cyathio centrali plurilobatum), lobis brevibus rotundatis magis minusve emarginatis araneoso-ciliolatis, glandulis 5 (vel in cyathio centrali pluribus) transverse ellipticis vel late-subreniformibus integris (vel in cyathio centrali nonnullis emarginatis vel subbilobis); bracteae bracteolaeque araneoso-lanatae. *Ovarium* trigonum, glabrum; stigmata matura non visa.

UGANDA. Mawokota, *E. Brown*, 414.

The habitus description has been drawn up from an excellent photograph of a specimen growing in the Entebbe Gardens, where it had been transplanted from Mawokota. Mr. E. Brown writes that he found the plant only once in the wild state.

977. **Bulbine torta,** *N. E. Brown* [Liliaceae]; affinis *B. minimae*, Baker, foliis crassioribus et valde tortuosis facile distinguitur.

Bulbus parvus palmatim divisus. *Folia* 8-10, erecta, valde tortuosa, 3-4 cm. longa, 0·75 mm. crassa, lineari-filiformia, glabra. *Scapus* (cum racemo 2·5 cm. longo) 6 cm. altus, inferne nudus, glaber. *Bracteae* 2·5–4 mm. longae, membranaceae, ovatae, acuminatae, leviter rufescentes. *Pedicelli* 5–6 mm. longi, graciles, glabri. *Perianthii* segmenta valde patentia vel subreflexa, 6 mm. longa, 1·5 mm. lata, lineari-oblonga, obtusa, glabra, lutea. *Staminum* filamenta e basi fere ad apicem pilis clavatis dense barbata; antherae subquadrato-orbiculares, bilobae.

SOUTH AFRICA. Worcester Div.; Karoo at Matjesfontein, Aug., 1895, *F. E. Weiss*, 10.

978. **Andropogon (§ Arthrolophis) heterantherus,** *Stapf* [Graminaceae]; affinis *A. canaliculato*, Schum., sed culmis inferne tenacioribus, plurinodis, foliis brevioribus, articulis pedicellisque praeter basin barbatam glaberrimis vel subglabris, spiculis pedicellatis angustioribus minoribus, antheris spiculae sessilis 1 mm., spiculae pedicellatae 3 mm. longis distinctus.

Gramen perenne. *Culmi* cum innovationibus perpaucis extravaginalibus basi paulo tumidis arcte fasciculati et e rhizomate brevi tenui orti, 0·5 m. vel ultra alti, glaberrimi, laeves, 5-vel pluri-nodi, internodiis plerumque gracilibus sed inferioribus saltem tenacibus teretibus magis minusve exsertis, fere tota longitudine e nodis saepe incrassatis ramosi vel gemmis inferioribus hebetatis, ramis intravaginalibus erectis. *Foliorum* vaginae

arctae, tenuiter nervoso-striatae, basales haud persistentes, caeterae glabrae vel superiores magis minusve hirsutae imprimis superne secundum margines ; ligulae scariosae, ad latera haud herbaceae truncatae, brevissimae ; laminae lineares, longe setaceo-attenuatae, basi constrictae, rotundatae, 10–15 cm. longae, ad 6 mm. latae, planae, basi supra ligulam pilis longis albis barbatae, aliis hinc inde praesertim secundum margines asperas additis, costa tenui, nervis lateralibus primariis utrinque circa 5 supra a secundariis interjectis vix distinctis. *Racemi* geminati culmos et ramos foliatos terminantes, graciles, circiter 10 cm. longi, longe e spatha propria laxiuscula laminam brevem angustam gerente exserti, superior pedunculo circiter 5 mm. longo glabro suffultus, multinodi, flavescentes ; articuli pedicellique 5 mm. longi, similes, clavati, dorso alte convexi, truncati, basi angusti, et breviter barbati, caeterum glabri, nitidi. *Spicula sessilis* inter articulum pedicellumque nodi sui arcte cuneata, a latere compressa, ad 7 mm. longa, callo 1 mm. longo glabro sulcato incluso ; gluma inferior anguste lanceolata, tenuiter acuminata, acumine 2-dentato, dorso profunde canaliculata, superne in carinis subscabrida, caeterum laevis, chartacea, nitidula, nervis utrinque 3, subcarinali viridi, interiore sulcum comitante brunnescente ; gluma superior cymbiformis, acuta, quam inferior vix brevior, chartacea, ciliolata, carina sublaevi, nervo utrinque 1 submarginali ; valvae hyalinae, inferior oblonga, acuta, 5 mm. longa, ciliolata, 2-nervis, superior oblonga, bifida, 3 mm. longa, eciliata, arista geniculata gracili, columna 7–8 mm. longa, seta aequilonga ; palea quam sua valva duplo brevior, alte bifida, enervis. *Spicula pedicellata* lanceolata, acute acuminata, 6–6·5 mm. longa, viridula ; gluma inferior mucronulata, nervis arctissimis circa 9 tenuibus intermedio paulo validiore ; gluma superior 5 mm. longa, acutissima, 3–5-nervis, ciliolata ; valvae anguste oblongae, acutae, hyalinae, inferior ad 5 mm. longa, 2-nervis, ciliolata, superior brevior, delicate 1-nervis, eciliata, cum palea alte bifida duplo breviore. *Stamina* in utraque spicula 3 ; antherae aurantiacae, spiculae sessilis 1 mm. longae, pedicellatae 3 mm. longae. *Caryopsis* oblonga, 2·2 mm. longa. *Ischaemum chrysatherum*, K. Schum. in Engl. Veget. Verh. Usambeira, pp. 14 and 28 (name).

East Africa. Usambara, in bush near Muoa, *Holst*, 3,073 ! also near Amboni, *Holst* (according to Engler, l.c. p. 28).

379. **Andropogon** (§ **Arthrolophis**) **perligulatus**, *Stapf* [Gramineae] ; affinis *A. canaliculato*, Schum., sed ligula 1 cm. (vel ultra) longa, articulis pedicellisque vix tumidis, aristis validioribus ad 25 mm. longis distinctus.

Culmi (partes superiores tantum extantes) graciles, glabri, laeves, teretes, ad nodos albido-pruinosi. *Foliorum* vaginae superiores subtumidae, ad 5 mm. latae, subcarinatae, glaucoviridesvel rubentes, glaberrimae, laevissimae ; ligulae ad 13 mm. longae, scariosae praeter latera firme herbacea nervosa in lobos acutos producta ; lamina anguste linearis, inferne longe attenuata, ultra 20 cm. longa, 3-4 mm. lata, superne aspera, caeterum laevis, glabra, costa albida valida, nervis lateralibus primariis utrinque 2-3, paucis secundariis interjectis. *Inflorescentia* spuria foliata, 2-noda ramo solitario e nodo inferiore ; pedunculi communes graciles, 6-9 cm. longi, in spatha propria angusta vel dilatata

glabra laminam filiformem vel subcapillarem gerente inclusi. *Racemi* 2-nati, sub spathae ore exserti, superior pedunculo 5 mm. longo suffultus, 5-6 cm. longi, flavescentes ; articuli pedicellique 3 mm. longi, similes (nisi illi magis cuneati marginibus rectis, hi vero marginibus leviter convexis), praeter basin et margines breviter barbatos ciliatosque glabri, nitiduli, apice suboblique truncati, vix emarginati. *Spicula sessilis* inter articulum pedicellumque sui nodi cuneata, a latere admodum compressa, 5 mm. longa, glabra, callo brevissimo impresso nudo ; gluma inferior lineari-lanceolata, minute truncata, dorso profunde anguste canaliculata, superne in carinis spinuloso-ciliolata, caeterum laevis, chartacea, nervis 7-8, utrinque sub carinis 2 vel 3 tenuibus quorum 1 saepe extra-carinalis, 1 utrinque ad sulcum, apice nervo medio brevissimo addito ; gluma superior cymbiformis, lata, inferiorem aequans, acuta, subchartacea, lucida, carina superne asperula, marginibus ciliolatis, utrinque nervo submarginali tenui ; valvae hyalinae, longe ciliatae, inferior late oblonga, truncatula, 9 mm. longa, 2-nervis, superior late oblonga, biloba, 3·5 mm. longa, arista geniculata, columna pallide brunnea, 10-12 mm. longa, seta aequilonga vel paulo longiore ; palea sub-binervis, 3 mm. longa, eciliata. *Spicula pedicellata* lanceolata, acutissima, 1-2-mucronata, 5·5 mm. longa ; gluma inferior ad flexuras angustissimas hispidula, in dorso subscaberula, nervis circiter 13 quorum 5 interiores magis distantes, mucrone ad 2 mm. longo ; gluma superior dorso convexa, 3-sub-5-nervis, ciliolata, mucrone circa 1 mm. longo ; valvae oblongae, 5 mm. longae, hyalinae, ciliatae, acutae, inferior 2-nervis, superior 3-nervis cum palea oblonga subenervi eciliata 3 mm. longa et flore ♂. *Antherae* 3-3·5 mm. longae.

WEST AFRICA. Togoland, Misa Höhe, *Baumann*, 318.

980. **Andropogon** (§ **Arthrolophis**) **pinguipes**, *Stapf* [Graminaceae]; affinis *A. canaliculato*, Schum., sed laminis basi longe anguste attenuatis vel petiolatis, articulis pedicellisque altius convexis, gluma inferiore spiculae sessilis late concava distinctus.

Perennis ? (partes basales desunt). *Culmi* extantes ad 45 cm. longi, graciles, glabri, laeves, infra ramos floriferos 2-nodi. *Foliorum* vaginae arctae, teretes, laeves, nervoso-striatae ; ligulae scariosae, truncatae, ciliolatae, ad latera ob vaginam continuatam herbaceae, nervosae, sed haud in auriculos productae ; laminae lineares, setaceo-acuminatae, basin versus longe angusteque attenuatae vel petiolatae, ad 20 cm. longae, 5 mm. latae, planae, flaccidulae, utrinque minute puberulae, rubentes, ad margines et nervos scabridulae, costa inferne incrassata albida caeterum uti nervis lateralibus tenui. *Panicula* spuria foliata, 3-4-noda, ramis solitariis vel paucis fasciculatis ; pedunculi communes graciles, apice paulo incrassati, 6-8 cm. longi, e spatha propria angusta (rarius dilatata) glabra laminam brevem subulatum gerente breviter exserta. *Racemi* 2-nati, superior pedunculo 4-5 mm. longo glabro suffultus, flavescentes, 3-4 cm. longi ; articuli pedicellique simillimi, breviter clavati, in dorso nitido saepe purpureo-maculato valde convexi, facie angusta subconcavi, vix 4 mm. longi, basi et ad angulos (pracipue interiores) breviter ciliati, oblique truncati ; pedicelli emarginati. *Spicula sessilis* inter articulum pedicellumque nodi sui cuneata, a latere compressa, triquetra, 5-6 mm.

longa, callo brevi impresso breviter barbato incluso; gluma inferior lanceolata, minute truncata, dorso late convexa, basi ad callum distincte constricta, superne in carinis asperula, caeterum laevis, chartacea, nitidula, nervis 7-8 praeter duos intimos remotos approximatis tenuissimis; gluma superior cymbiformis, inferiorem aequans, paulo ultra 1 mm. lata, subacuta, tenuiter chartacea, lucida, carina subasperula, marginibus ciliatis, utrinque nervo 1 submarginali tenui; valvae hyalinae, longe ciliatae, inferior oblonga, truncatula, ad 5 mm. longa, 2-nervis, superior anguste oblonga biloba, 3·5 mm. longa, arista geniculata, columna pallide brunnea, circiter 9 mm. longa, seta aequilonga. *Spicula pedicellata* elliptico-oblonga, acuta, 6-6·5 mm. longa, viridula; gluma inferior aristulata, aristula ad 3 mm. longa, ad flexuras angustas a medio hispidulo-ciliolata, nervis arctis tenuibus 20-24 aequalibus; gluma superior inferiori aequilonga, acuta, 3-nervis, ciliata; valvae oblongae, hyalinae, inferior ad 5·5 mm. longa, latior, obtusa, 3-nervis, 1-nervis, minute bidentata, eciliata, 4·5 mm. longa, cum palea enervi, 2·5 mm. longa et flore ♂. Antherae 3·5 mm. longae.

SENEGAMBIA. M'Bidjen, *Thierry*, 92.

L.—NEW ORCHIDS: DECADE 32.

311. **Liparis rhodochila**, *Rolfe*, ad *L. bicolorem*, J. J. Smith, accedit, sed labello non profunde bilobo differt.

Pseudobulbi caespitosi, late ovoideo-oblongi, subcompressi, circa 1·5 cm. longi et lati, vaginis ovatis cucullatis vestiti, monophylli. *Folia* elliptico-oblonga, apice minute bidenticulata, circa 7 cm. longa, 3 cm. lata. *Scapi* terminales, erecti, subcompressi, circa 8–9 cm. longi, multiflori. *Bracteae* lanceolatae, acutae, 5–7 mm. longae. *Pedicelli* 8–10 mm. longi. *Sepala* reflexa, oblonga, obtusa, 7–8 mm. longa. *Petala* linearia, obtusa, 7–8 mm. longa. *Labellum* late unguiculatum; unguis erectus; limbus arcte reflexus, obovatus, apice truncatus et minute denticulatus, 4 mm. latus; discus crassiusculus. *Columna* clavata, 4 mm. longa, alis brevissimis et latis.

JAVA.

Sent for determination by Sir Trevor Lawrence, in September, 1908. It was imported by Messrs. J. W. Moore, Rawdon, Leeds, who inform us that it came from Java. The sepals and petals are light green, and the lip reddish crimson. *L. bicolor*, J. J. Smith, is only known to us from description, but besides having a deeply two-lobed lip the leaves and scape are over a foot long.

312. **Bulbophyllum Dixoni**, *Rolfe*; a *B. Pechei*, Bull (*Bot. Mag.* t. 7286), scapo longiore, floribus brunneo-maculatis et petalis caudato-setiferis differt.

Herba epiphytica. *Rhizoma* validum. *Pseudobulbi* pentagoni, ovoidei, monophylli, circa 3 cm. longi. *Folia* oblongo-lanceolata, subacuta, circa 9 cm. longa, 1·5 cm. lata. *Scapi* suberecti, 15–18 cm. longi, prope basin vaginis tubulosis vestiti; racemi subnutantes, multiflori. *Bracteae* triangulares, acutae, 3–4 mm. longae. *Pedicelli* crassiusculi, 5 mm. longi. *Sepalum* posticum ellipticum, obtusum

vel minute apiculatum, 7 mm. longum; sepala lateralia ovato-oblonga, acuta, 8 mm. longa. *Petala* triangularia, apice caudato-setifera, 4 mm. longa. *Labellum* carnosum, oblongum, obtusum, canaliculatum, 4–5 mm. longum; lobi laterales erecti, late oblongi, obtusi, 1 mm. longi. *Columna* crassa, 3 mm. longa; dentes subulati, 1 mm. longi.

SIAM. Mountains round Chengmai, *Dr. Arthur Kerr.*

Sent for determination from the Trinity College Botanic Garden, Dublin, by Dr. H. H. Dixon, in February, 1908. The flowers are light greenish yellow, with numerous more or less confluent dark brown spots on the sepals, and the lip dusky brown with a yellow median line.

313. **Ione grandiflora**, *Rolfe*; ab *I. Andersoni*, King et Pantl., floribus triplo majoribus et purpureis differt.

Rhizoma repens, gracile. *Pseudobulbi* subapproximati, ovoidei, 1·5–2 cm. longi, monophylli. *Folia* oblonga, subacuta, coriacea, 3–5 cm. longa, circa 1 cm. lata. *Scapi* erecti, validi, circa 2 cm. longi, uniflori. *Bracteae* late elliptico-oblongae, acutae, cucullatae, 6 mm. longae. *Sepala* patentia; posticum oblongum, acutum, recurvum, 12–15 mm. longum; lateralia oblonga, acuta, 12–15 mm. longa, basi in mentum brevissimum vel fere obsoletum connata. *Petala* oblonga, acuta, recurva, 10–12 mm. longa. *Labellum* late cordato-ovatum, subobtusum, subcarnosum, 12 mm. longum, 10 mm. latum, facie papilloso-hirsutum, basi concavum et carinatum. *Columna* lata, 3 mm. longa, apice denticulata, facie bidentata, dentibus brevibus crassis et decurvis. *Pollinarii* caudiculae ad glandulas distinctas insertae.

BURMA.

A very distinct species which flowered in the collection of Sir Trevor Lawrence, in November, 1902, and afterwards at Glasnevin, whence the record of habitat was obtained. It most resembles *I. Andersoni*, King et Pantl., in habit, and in having the cadicles of the pollinia attached to two distinct glands, but the flowers are about three times as large, and of a dull lurid purple throughout, while the lip is totally different in structure.

314. **Ione siamensis**, *Rolfe*; affinis *I. scariosae*, King et Pantl., floribus bracteis exsertis et multo longioribus, segmentis patentibus facile distinguenda.

Rhizoma repens, subgracile. *Pseudobulbi* tetragono-ovoidei, circa 2 cm. longi, 1 cm. lati, basi vaginis scariosis tecti, monophylli. *Folia* anguste oblonga, subacuta, coriacea, apice subrecurva, circa 7 cm. longa, 1 cm. lata. *Scapi* suberecti, graciles, circa 15 cm. longi, vaginis tubulosis circa 5 tecti; racemi patentes, circa 6 cm. longi, 9–10-flori. *Bracteae* ovato-oblongae, subacutae, scariosae, venosae, 5–7 mm. longae. *Flores* distichi. *Pedicelli* crassi, 5 mm. longi. *Sepala* patentia; posticum ovatum, apice acutum et revolutum, 5 mm. longum; lateralia auguste triangularia, acuta, carinata, 7 mm. longa. *Petala* patentia, late ovata, obtusa, minutissime denticulata, apice subrecurva, 3 mm. longa. *Labellum* anguste ovato-oblongum, obtusum, carnosum, caniculatum, 5 mm. longum. *Columna* brevissima; dentes minutissimi vel subobsoleti. *Pollinarii* caudiculae ad glandulam unicam insertae.

SIAM. Mountains round Chengmai, *Dr. Arthur Kerr.*

Sent for determination by Dr. H. H. Dixon, Trinity College Botanic Garden, Dublin, in June, 1908. The flowers are pale green, with a distinct suffusion of dull purple on the lateral sepals and lip, while the other segments have a few minute purple dots near the margin. The appearance of this species fully confirms the inclusion of *Sunipia scariosa*, Lindl., in the genus *Ione*, as proposed by King & Pantling, it being most like the former in habit, and having the rostellum quite similar in structure, while the longer spreading segments agree with *Ione*.

315. **Glomera samoensis**, *Rolfe* ; a *G. montana*, Reichb. f., foliis paullo minoribus, et labello latius differt.

Caules validi. *Folia* linearia, apice obliqua, subobtusa, basi paullo latiora, 6–11 cm. longa, 5–10 mm. lata ; vaginae striatae puncticulatae. *Capitulae* sessiles, nutantes, 2–2·5 cm. latae, multiflorae, basi vaginis ovatis concavis imbricatis amplis tectae. *Bracteae* oblongae, obtusae, membranaceae, circa 8 mm. longae. *Pedicelli* circa 6 mm. longi. *Sepalum* posticum elliptico-oblongum, obtusum, 5 mm. longum ; lateralia oblique oblonga, apiculata, basi connata, saccata. *Petala* elliptico-oblonga, obtusa, 5 mm. longa. *Labellum* obovato-orbiculare, obtusum, 3 mm. longum ; saccus globosus, 3 mm. longus. *Columna* lata, 2 mm. longa, dentibus latis obtusis.

SAMOA ISLANDS. Apia, *Dr. B. Funk*, 11.

316. **Coelogyne albo-lutea**, *Rolfe ;* a *C. Huettneriana*, Reichb. f., scapis erectis, bracteis persistentibus et labelli lobis angustioribus differt.

Rhizoma validum. *Pseudobulbi* ovoideo-oblongi, sulcati, circa 8 cm. longi, basi vaginis ovatis imbricatis obtecti, apice diphylli. *Folia* breviter petiolata, lanceolato-elliptica, acuta, coriacea, 15–18 cm. longa, 4–5 cm. lata. *Scapi* floriferi ad basin pseudobulborum imbricato-vaginati, arcuati, 15–18 cm. longi, 5–7-flori. *Bracteae* lanceolato-oblongae, acutae, 2·5–3·5 cm. longae, persistentes vel subpersistentes. *Pedicelli* circa 1·5 cm. longi. *Flores* speciosi, albi, labello medio flavo. *Sepala* subpatentia, lanceolato-oblonga, acuta, leviter carinata, 2·5–3 cm. longa. *Petala* sepalis similia, non carinata. *Labellum* trilobum, circa 2 cm. longum ; lobi laterales erecti, oblongi, obtusi ; lobus intermedius ovatus, acutus, convexus ; discus ad basin lamellis ternis valde undulatis ornatus. *Columna* clavata, circa 1 cm. longa ; clinandrium membranaceo-dilatatum.

MOUNTAINS OF N. INDIA.

A distinct and handsome species, introduced by Messrs. Sander and Sons, and flowered in their Nursery, at St. Albans, in May, 1896, and subsequently in the Royal Botanic Gardens, Glasnevin. The flowers are very fragrant, and pure white, with the greater part of the side lobes deep yellow, and the base of the front lobe rather lighter yellow. The keels are white, except at the apex, where they extend into the yellow area.

317. **Coelogyne Loheri**, *Rolfe ;* species insignis, affinis *C. chloropterae*, Reichb. f., sed labelli lobo intermedio magno et emarginato differt.

Pseudobulbi fasciculati, ovoideo-oblongi, subcompressi, 4–5 cm. longi, 1·5–2 cm. lati, apice diphylli, vaginis lanceolato-oblongis striatis imbricatis obtecti. *Folia* breviter petiolata, lanceolato-oblonga, acuta vel apiculata, subundulata, prominente 3–5-nervia, coriacea, 12–15 cm. longa, 1·3–2·3 cm. lata. *Scapi* terminales, a pseudobulbo immaturo producti, erecti, 12–15 cm. longi; racemi flexuosi, circa 5–7-flori. *Bracteae* deciduae, lanceolato-oblongae, acutae, striatae, concavae, 1·5–2·5 cm. longae. *Pedicelli* graciles, 1–1·5 cm. longi. *Sepala* oblonga, acuta, carinata, 2–3·3 cm. longa; lateralia 6 mm. lata; posticum 9 mm. latum. *Petala* linearia, acuta, 2–2·3 cm. longa, 2 mm. lata. *Labellum* elliptico-oblongum, trilobum, 1·8–2 cm. longum, 10–12 mm. latum; lobi laterales oblongi, obtusi, breves; lobus intermedius late ovatus, emarginatus, undulatus; discus 5-carinatus, carinis valde crispo-undulatis. *Columna* clavata, alata, 1·2 cm. longa.

PHILIPPINES. Prov. Benguet; without precise locality, *Loher*, 549, 552.

318. **Scaphyglottis alba**, *Rolfe*; a *S. longicauli*, S. Watson (ex descriptione), pseudobulbis brevioribus, floribus multo minoribus et albis differt.

Caules fasciculati, anguste fusiformi, circa 4–5 cm. longi, vaginis pallidis striatis obtecti, apice diphylli. *Folia* linearia, apice minute biloba, subconduplicata, submembranacea, 4–6 cm. longa, 3–4 mm. lata. *Flores* fasciculati, terminales, albi. *Bracteae* lanceolatae, acuminatae, circa 3 mm. longae. *Pedicelli* 7–8 mm. longi. *Sepala* subconniventia, oblonga, subobtusa, circa 4 mm. longa. *Petala* sepalis paullo angustiora. *Labellum* subintegrum, cuneato-oblongum, obtusum vel retusum, fronte subundulatum, sepalis paullo longius. *Columna* clavata, 3 mm. longa, edentata; pollinia 4, compressa.

COUNTRY unknown.

Flowered in the Royal Botanic Gardens, Glasnevin, in May, 1908. First obtained from Messrs. Sander & Sons, in October, 1905, without any indication of habitat. The flowers are small, white, and borne in fascicles of 3 or 4 together.

319. **Maxillaria pusilla**, *Rolfe*; habitu *M. parahybunensi*, Cogn., similis sed foliis paullo angustioribus et labello subintegro et obtuso differt.

Caules brevissimi, robustiusculi, satis ramosi. *Pseudobulbi* lineari-oblongi, sulcati, vaginis imbricatis striatis tecti, circa 1 cm. longi, monophylli. *Folia* lineari-lanceolata, subacuta, crasso-coriacea, sessilia, 3–5 cm. longa, 3–5 mm. lata. *Scapi* solitarii, brevissimi, pseudobulbis breviores, vaginis imbricatis brevibus tecti. *Sepala* oblonga, obtusa, circa 1 cm. longa; lateralia paullo latiora, basi in mentum brevem obtusum extensa. *Petala* anguste oblonga, subobtusa, circa 1 cm. longa. *Labellum* subintegrum, obtusum, supra medium paullo recurvum, fere 1 cm. longum; discus nitidus et callo oblongo carnoso instructus. *Columna* clavata, circa 7 mm. longa.

COUNTRY unknown.

Sent for determination by Messrs. Sander & Sons, St. Albans, with whom it flowered in July, 1908. The sepals and petals are brownish green, somewhat darker at the base, and the lip dark purple and very shining, with a lighter apex. The allied species are natives of Brazil.

320. **Sigmatostalix Eliae**, *Rolfe*; affimis *S. pictae*, Reichb. f., sed partibus omnibus minoribus et floribus maculatis differt.

Pseudobulbi compressi, ovato-oblongi, circa 1·5 cm. longi, apice monophylli, basi 2–3 phylli. *Folia* oblonga, oblique et brevissime bidentata, tenuia, basi attenuata, 2–7 cm. longa, 6–13 mm. lata. *Scapi* tenues, circa 18 cm. longi, multiflori. *Bracteae* lanceolato-oblongae, circa 4 mm. longae. *Pedicelli* 3–4 mm. longi. *Sepala* et *petala* oblongo-lanceolata, acuta, reflexa, 6–7 mm. longa. *Labellum* patens, late unguiculatum, 3-lobum; lobus intermedius reniformi-orbicularis, convexus, 7–8 mm. latus, apice reflexus et acutus; lobi laterales reflexi, lineari-oblongi, obtusi, 2 mm. longi; unguis 3 mm. longus. *Columna* clavata, arcuata, basi gracilis, 5 mm. longa, alis obsoletis.

Colombia. Velez district, *Birchenall.*

Flowered in the collection of Mr. Joseph Birchenall, Alderley Edge, Cheshire, in January, 1908, and dedicated by request to his wife. It was found growing in the Velez district, at a lower altitude than *Odontoglossum crispum*, Lindl., in intermediate temperature. The flowers are yellow, spotted with reddish brown on all the parts.

LI.—A LANCASHIRE WILLOW FARM.

W. Dallimore.

For upwards of half a century the village of Mawdesley has been famous for its willow beds and basket-making industry, and Mawdesley-grown rods have acquired a considerable reputation in the willow trade for strength and durability. Mawdesley differs from most willow-growing centres in possessing very little wet or marshy land, and willows are grown under similar conditions to such farm crops as potatoes, cabbages, corn, &c. It is to this comparatively dry method of culture that the special toughness of the rods grown in the district is attributed.

Mawdesley is situated in south-west Lancashire, almost midway between Liverpool and Preston, at the foot of Harrock and Parbold hills. The nearest station is Rufford, a distance of about 2½ miles, whilst the nearest important town is Wigan, which lies a few miles away in the opposite direction.

Being in the neighbourhood recently, I took the opportunity of paying a visit to the farm of Mr. Hugh Cowley, who is the largest grower in the district, for the purpose of obtaining information as to the methods of culture adopted, and Mr. Cowley very kindly furnished me with the particulars embodied in the following notes.

The pioneer of the movement in Mawdesley was Mr. Cowley's father, and his first venture was with a farm of 11 Cheshire acres (= about 23¼ English acres). As he had learnt from old growers that willow beds were only remunerative up to 14 years of age, he obtained a lease for that period. His methods of culture, however, proved so effective, that at the time his lease ran out the beds were more productive than they had ever been, and he was glad to renew his lease at an increased annual rental of £30. For many years the business proved highly satisfactory, and more land was continually required until he and his sons had about 500 acres under cultivation. Other farmers also planted largely when the trade was at its best, but of late years, owing principally to depression in trade and foreign competition, a considerable amount of land has been reclaimed for ordinary farm crops. According to Mr. Cowley, however, taking good and bad years together, willows pay at least as well as other farm crops.

When forming a willow bed, the ground is well worked and cleaned, and good, strong cuttings are inserted one foot apart in rows two feet apart. The majority form sturdy plants the first year, and are assisted by being kept perfectly free from weeds and by frequent working of the surface soil. In fact, to be successful with a crop of willows, Mr. Cowley contends that throughout life they must be kept as free from weeds as any other crop. A full crop of rods may be expected from strong-growing varieties the third year after planting, but weak-growing kinds require a year or two longer. Harvesting operations are got through as quickly as possible after the fall of the leaves. Usually, the stools are cut over annually, but when specially strong rods are required, they are allowed to remain for two years. When cutting the rods, great care is taken to remove them close to the stool. If this is not done, numerous buds are left, which result in large numbers of weak shoots the following year instead of a smaller number of more vigorous ones. As soon as possible after the removal of the crop, the ground is well cleaned and worked, and a dressing of manure is given. The manure which finds most favour with Mr. Cowley is a Manchester production prepared principally from night soil. This is sold in bags, and is easily transported. The usual dressing is at the rate of one ton to the acre, and this is repeated in spring, an additional dressing being given a month or two later if the ground is poor. When carefully cultivated, a willow plantation will give good results for a very long period. I was shown fields in full vigour which had been down between 20 and 30 years, and still older ones exist. In the event of a bed being neglected and left unworked and unmanured, it is ruined in from three to five years. The destruction of a willow bed is a simpler operation than would be expected. A strongly horsed plough is run along a row close to the stools ; it is then run along the opposite side, turning the stools over ; men follow, and drag the plants out ready for the next furrow. In this way a field is ploughed in very little more time than a clear field would be.

When removed from the ground the rods are made into stacks and are left for use. Many of the finer-growing sorts are peeled for fancy work, and the peeling is done as the rods are harvested. Previous to peeling they are soaked in boiling water. From the

boiler they are taken to the stripping room where the bark is removed by women. The rods are then placed in a heated shed to dry, after which they are graded into sizes ready for use. Although attempts have been made to find a use for the bark they have so far failed, and it is simply a waste product.

A few years ago baskets of all descriptions were made both for English and foreign markets, but now only those kinds are made for which there is a local demand, and the majority of the rods suitable for fine work are sold ready for use. A brisk trade is carried on in potato hampers, and there is a good demand for pigeon and fowl baskets.

The majority of the varieties of basket-making willows grown in the country have been tried at Mawdesley, but most of them have been discarded as unsuitable for the district, and only a few selected forms of two or three species are grown, which are recognised by local names. Specimens were, however, obtained, and in the following descriptions they are allotted to their respective species.

The varieties are :—

"Red Buds" or "Old Dicks"; "Long Skeins" or "Light Long Skeins"; "Black Stemmed"; "Mawdesley's Long Skein"; and "Ran Dan." Two others known respectively as "Tulip Willow" and "Kecks" were at one time widely grown, but have been superseded by "Red Buds."

"Red Buds" or "Old Dicks" is a well-marked form of *Salix purpurea*; the botanical variety *scharfenbergensis* most closely approaches it in general appearance. It is of comparatively weak growth, and is conspicuous by reason of its red stems and buds. It is the most useful of all the willows grown in the district for neat or fancy work, and usually commands the best price. The rods are always used in a peeled state and are obtainable in five different sizes, the longest ones being from 4 to 4½ ft. in length, the shortest 2 to 2½ ft. The first-mentioned name evidently applies to the prominent red buds, whilst the latter is an abbreviation of "Old Dick Meadow's Willow." Richard Meadows was an employé of the Earl of Lathom, and amongst his other duties he manufactured rough wicker baskets for the distribution of game. On one occasion he noticed some nice willow rods round a bundle of imported plants. From these he procured cuttings which resulted in superior rods to anything he had previously worked. He distributed cuttings amongst his friends and Mr. Cowley obtained a quantity. These became so popular that on one farm alone upwards of 100 tons are frequently produced in a single season. The yield of rods per acre of this variety is from eight to nine tons. *S. purpurea*, the "Purple Osier," is widely distributed through Europe and Central and Northern Asia, and is a variable plant.

The variety called "Kecks" is a form of *S. purpurea* with green bark and larger leaves than the form already mentioned; it is, however, of very inferior merit, and has been discarded.

"Long Skeins," or "Light Long Skeins," is a stronger-growing willow than the last mentioned, of very good quality. It is a selected form of the British *Salix viminalis*, and was originally imported to Mawdesley from Knowsley. It is used both plain

and peeled, and is suitable for many kinds of work. The longest rods of a single year's growth are from 6 to 8 ft., those of two years' growth being some 3 or 4 ft. longer.

"Mawdesley's Long Skein" is another European species, *Salix rubra*. It grows to about the same height as the last named form, and is used for similar purposes, both peeled and unpeeled, the rods are, however, said to be slightly harder to work.

"Black Stemmed" or "Black Willow" is *Salix daphnoides*, the "Violet Willow" of Europe, &c. This has not been in use many years, but is thought highly of for the larger kinds of work. Rods 12 ft. in length are produced in a single season, which are found to be of excellent quality for farm baskets. The peculiar glaucous or bluish colouring seen on growing rods is even more conspicuous after the rods have been dried. My attention was called to a number of potato baskets where this particular variety had been used in bands with another variety, and in the distance the appearance was exactly that of bands of light blue paint.

"Tulip Willow" is a form of *S. rubra*. It is said to produce rods of good quality, but has been discarded in favour of "Red Buds" on account of its liability to produce side branches, which cause extra expense in preparing for use. A peculiarity of the variety is the habit the rods have of dividing into double growths when about half grown.

"Ran Dan" concludes the varieties grown. It is correctly *Salix Smithiana* var. *acuminata*. The rods are strong and grow to a good length the first season. They are, however, usually allowed to grow for three or four years, and are then used for splitting to use in the bottoms and sides of strong hampers.

In conclusion, it may be of interest to note that the willow industry at Mawdesley had its origin through the chance visit of a basket-maker to the neighbourhood. He noticed a patch of willows growing in an out-of-the way corner of a field, and offered the farmer a price for them, which seemed more than the land was worth. This led to the first idea for a willow farm.

LII.—BAGNISIA HILLII, Cheesem.

A New Species of Burmanniaceae from New Zealand.

The following note and diagnosis of a new species of *Bagnisia*, has been received from Mr. T. F. Cheeseman, of Auckland, New Zealand, for publication in the *Bulletin* :—

The *Burmanniaceae* are very largely tropical in their distribution, so that considerable interest attaches to the discovery of a species so far to the south as New Zealand. In January, 1903, Mr. H. Hill, of Napier, forwarded to the writer a single specimen of a plant found by him at Opepe, near Lake Taupo, which, from its habit and general appearance, was at once provisionally referred to the family, although the condition of the specimen was such that positive identification was impossible. A special journey

made to Opepe in company with Mr. Hill resulted in the discovery of another specimen, also in an imperfect state. In January of this year I succeeded in inducing Mr. Hill to pay another visit to the locality, when he was fortunate enough to find a considerable number of specimens in full flower, most of which he kindly forwarded to me. An examination of these has proved that the plant belongs to the sub-family *Thismieae*, which differs from the rest of the *Burmanniaceae* in possessing both the inner and outer whorls of stamens, and in the unusually large development of the anther-connective. It further appeared that there was little to separate Mr. Hill's plant from the genus *Bagnisia*, as amended by Engler in *Die Natürlichen Pflanzenfamilien* (vol. ii. 6, p. 48), where it is made to include both *Bagnisia* and *Geomitra* of Beccari (*Malesia*, vol. i. pp. 249–250, tt. 10, 11, 12), the only difference of importance being that in *Bagnisia* and *Geomitra* three of the perianth segments are wanting, or reduced to mere rudiments; whereas in the New Zealand plant they are well-developed, being quite half the length of the inner segments. In this respect it agrees with the genus *Thismia*, but differs in the inner perianth segments being dilated and connivent at the tips, exactly as in *Bagnisia* and *Geomitra*. In the position of the stamens and in the structure of the anther it agrees with *Geomitra*; in fact the anther-connective of *Geomitra episcopalis*, as figured by Beccari, very closely resembles that of the New Zealand plant. If, therefore, Engler is to be followed in merging *Geomitra* with *Bagnisia*, it appears to me that the New Zealand plant should be placed in the latter genus.

Bagnisia (Geomitra) Hillii, *Cheesem.* *Planta* saprophytica, humicola, pusilla, glaberrima, foliis ad squamas minutas redactis. *Rhizoma* repens inter folia emortua delapsa sylvarum, parce vel copiose ramosum, 5–10 cm. longum, 1–1·5 mm. crassum, nudum, carnosum. *Pedunculi* ex axillis bractearum brevium carnosarum, orti, uniflori, erecti vel curvati, 0·5–1·5 cm. longi, bracteolis circiter 7 alternis lanceolatis vel ovato-lanceolatis acutis albidis sursum gradatim majoribus 1–5 mm. longis instructi. *Flores* rosei, ratione plantae magni, 1–1·7 cm. longi, circiter 7·5 mm. diametro. *Perianthium* campanulato-lanterniforme; tubus obovato-oblongus, 6-costatus; segmenta 3 minora omnino exteriora, libera, ovato-oblonga, oblique patentia, demum longitudinaliter arcte recurva, in alabastro fenestras obtegentia; segmenta 3 interiora quam exteriora fere duplo longiora, apice connata vel conniventia, medio hiantia, obovato-oblonga, dorso carinata, carina in apiculum producta. *Stamina* 6, fauci affixa et breviter exserta, abrupte decurva et intra tubum deflexa, filamentis brevibus, liberis; connectiva maxima, in tubum membranaceum connata, apice bilamellata; loculi parvi, distincti, adnati. *Ovarium* inferum, late obovatum, uniloculare, placentis 3 liberis; ovula numerosissima; stylus brevis, crassus, apice trifidus, ramis in limbum parvum subquadratum concavum productis. *Fructus* ignotus.

NEW ZEALAND: Northern Island; in primeval woods at Opepe, near Lake Taupo, *H. Hill*; *T. F. Cheeseman*.

Bagnisia Hillii is usually found on the mound of decaying leaves and humus which accumulates at the base of the trunk of

the Kahikatea Pine, *Podocarpus dacrydioides*. On account of its small size it is easily overlooked, even in the flowering season, the flowers being often partially concealed by fallen leaves. Once noticed, however, the bright rose-pink colour of the flowers enables the observer to pick it with ease. A drawing of the plant, with full analyses, will appear in the forthcoming "*Illustrations of the New Zealand Flora*," the preparation of which was announced in a recent number of this publication.

According to the most recent enumeration, that given by Dr. Pilger (Engler & Prantl, *Naturl. Pflanzenf. Nachtr.* iii., p. 72), four genera of *Thismieae* are now known, with about 14 species. Seven of these are from Brazil; the remainder come from Ceylon, Borneo, and New Guinea. The discovery of an additional species in New Zealand is a decidedly unexpected and somewhat puzzling fact in geographical distribution.

In the northern hemisphere the family is represented northward to China and Japan, and as far north as Virginia in America.

LIII.—MISCELLANEOUS NOTES.

Mr. Thomas Cartwright, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Sudan Government, on the recommendation of Kew, Superintendent of an experimental rubber plantation at Jebelein, on the White Nile.

Mr. Robert Band, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Curator of Botanic Stations in the Agricultural Department of the Gold Coast.

Mr. J. F. Duthie, B.A., F.L.S., who was appointed Assistant for India on the staff of the Royal Botanic Gardens in 1903 (*v. Kew Bull.*, 1903, p. 29) has resigned the post owing to ill-health.

Mr. J. Hutchinson, formerly a member of the gardening staff, has been appointed Assistant for India on the staff of the Royal Botanic Gardens by the Secretary of State for India in Council.

Sir Daniel Morris.—The retirement of Sir Daniel Morris, K.C.M.G., D.Sc., from the post of Imperial Commissioner of Agriculture for the West Indies was announced in the issue of the *Times* of October 13th, 1908.

He was appointed to this post in August, 1898 (*v. Kew Bull.*, pp. 234–237), and has occupied it with conspicuous success to the great benefit of the West Indian colonies. Under his careful and zealous management, agriculture in the West Indies has been placed on a firm and sound basis, and has been systematically organised throughout the various islands. Amongst the most useful of the works which have been encouraged and developed by

the Imperial Commissioner are the cultivation of cotton, the improvement of the sugar cane by hybridisation, and the extension of the culture of limes, cocao, &c. With regard to cotton, Sir Daniel revived its cultivation after a lapse of about 100 years, and personally introduced the Sea Island seed—the best long-staple cotton—into the islands. The cotton from the West Indies, especially that from St. Vincent, now obtains as high a price as any in the Manchester market. The experimental work on the sugar cane carried out by the Imperial Department of Agriculture, has been instrumental in giving a fresh impetus to sugar cultivation, which at one time appeared to be a doomed industry. At the Agricultural Conference, held in January last at Barbados, Sir Daniel was able to say that—"It is not improbable that in the near future seedling canes capable of resisting disease, while at the same time yielding a higher percentage of sugar, will be generally cultivated in these colonies."

One of the most important features of his administration has been the establishment of the intercolonial agricultural conferences, seven of which have been held during the ten years of his tenure of office. These have been of great value in bringing together the agriculturists and leading men of the various islands, and have helped to co-ordinate the work and stimulate agricultural interests in the different West Indian Islands.

In Sir Daniel Morris the West Indies are losing one who has given his best for the improvement of the conditions of the islands. He has handed on to his successor, Dr. Francis Watts, C.M.G., D.Sc.—the Superintendent of Agriculture for the Leeward Islands—a well-organised and thoroughly efficient department.

GEORGE NICHOLSON.—After a long and painful illness our esteemed friend and former colleague passed away peacefully on Sunday, September 20, in his sixty-first year. The son of a nurseryman of Ripon, Yorkshire, he grew up in a garden, and early developed a taste for flowers and for gardening. As a child he had a plot of ground assigned to him to lay out and cultivate as he pleased, and in those early days he showed great skill, we learn, in constructing miniature villas in their own tastefully planned gardens. He also formed a small rock garden and embellished it with a fountain engineered by himself. With increasing years he acquired a sound knowledge of the plants in his surroundings, both cultivated and wild, and he made a special study of hardy trees and shrubs, which gained for him the not undignified nickname of "Quercus." His education was of the ordinary "grammar school" kind, and he began working in his father's nursery-gardens while still quite young, remaining there until after manhood. At length the desire to see more and gain wider experience was irresistible, and he worked successively in the nurseries of Messrs. Fisher Holmes, of Sheffield, and Messrs. Low, of Clapton; afterwards going to Paris, where he obtained employment in the municipal gardens of La Muette. During the time—about two years—spent in France he laid the foundation of a knowledge of the French language, to which he was continually

adding almost to the last, and so fully did he realise the value of such knowledge that he was constantly impressing upon young men the desirability of learning at least one modern language. He went even further and devoted much time to the gratuitous teaching of others.

The turning point of Nicholson's life came in 1873. By chance he saw an advertisement inviting candidates for the post of Clerk to the Curator of the Royal Gardens, Kew, and he entered, with little hope of success, as there was absolutely no time for special preparation for the examination. There were five candidates, but he "displayed such quickness, intelligence and resources, and had so good an address" that he was finally successful. Although at first he was engaged almost entirely during official hours on clerical work, his activity out-of-doors commenced at once, for we find in the Journal of Botany, 1874, p. 127, that he was engaged on a Wild-Flora of Kew Gardens, which appeared in the same publication in 1875. He also continued his studies of the British Flora generally, with great enthusiasm, and made a very fine herbarium, which he eventually presented to the University of Aberdeen. He was very keen on segregates, and among others he collected a very fine series of the forms of *Cardamine pratensis*, among them *C. dentata*, Schultz, and *C. Hayneana*, Welw. In 1883 he discovered a *Scutellaria* at Virginia Water, which was regarded as a natural hybrid between *S. galericulata* and *S. minor*. In this connection it may be added that he joined the Botanical Exchange Club of the British Isles in 1875, and was Distributor and Reporter for the years 1883 and 1887.

The Director of Kew had been engaged for many years on the extension and nomenclature of the Arboretum before the appointment of Nicholson, who early took a great interest in it, but some years elapsed before he was officially associated in this task. About 1880 he began collecting and drying specimens of the hardy shrubs and trees, and checking their names, and in time the collection developed into a valuable herbarium for reference, supplemented, as it was, by figures, descriptions and correspondence relating to the specimens. In 1889 the collection was purchased by the Trustees of the Bentham Fund and presented to the establishment; since when it has been continually added to by his successors, and it is now probably the most nearly complete of its kind. Under the heading of "The Kew Arboretum" Nicholson published a series of twenty articles in the *Gardeners' Chronicle* for 1881, illustrated by Miss M. Smith. This series was followed by numerous papers on dendrology in various publications, references to the most important of which will be found in the Bibliography at the end of this memoir.

An official recognition of his work in the Arboretum appeared in the *Kew Bulletin*, 1901, p. 169. "Mr. Nicholson's services to Kew are well known. To him in great measure is due the present efficient condition of the Arboretum. The 'Handlist of Trees and Shrubs' was prepared by him, and is universally accepted as a standard authority for their nomenclature. Kew still hopes to retain the benefit of his botanical experience now that he has been relieved from the pressure of administrative duties."

On the retirement of John Smith the second, in 1886, Nicholson was promoted to the post of Curator, which he held until compelled by bad health to resign in 1901. At the time of his appointment he was in the midst of his great work, the "Dictionary of Gardening," which made him famous throughout the gardening world. An enlarged French edition, edited by his friend, S. Mottet, appeared during the years 1892–1899, and L. H. Bailey's "Cyclopaedia of American Horticulture," 1900–1902, is compiled on the same model. This is not the place to enlarge upon Nicholson's high and varied attainments, and the benevolent traits of his character, which brought him universal esteem and admiration. The Horticultural Press has done this and is unanimous in its appreciation of his talents and personal character. Always modest, he shrank from anything in the form of a public testimonial, but on his retirement a complimentary dinner was given in his honour, presided over by the late Dr. M. T. Masters, and a handsome silver salver was presented to him by his friends and colleagues, "who, while admiring his qualifications as a man of science and a gardener, have a warm appreciation of his worth as a friend."

He was elected an Associate of the Linnean Society in 1886, and became a Fellow in 1898; and he was one among the first sixty recipients of the Victoria Medal of Honour in Horticulture, on its institution in 1897. Mr. William Robinson, who was also a personal friend, dedicated to him in 1895 the forty-eighth volume of 'The Garden' in the most eulogistic terms. In 1894 he was awarded the Veitchian Medal. Among other distinctions he enjoyed was that of being first President of the Kew Guild, to which he was elected in 1894. For many years he was a member of the Scientific and Floral Committees of the Royal Horticultural Society, and he was a regular attendant during his later years until his malady reached a stage that prevented him from going out.

Nicholson was fond of travelling and of mountaineering, and he continued the latter at an age when it probably became detrimental to his health. Apart from his climbing expeditions, most of his journeys on the Continent were made in the company of the late H. Herbst, with whom he visited many parts of France and Germany and some parts of Italy and Spain. Notes on one of these journeys to Southern France and Northern Italy were published in a series of articles in the 'Garden and Forest' for 1889 and 1890. He twice visited America; the first time in 1893, and again in 1902. On the first occasion he acted as a judge in the horticultural section of the great Chicago Exhibition, and visited, in the interests of Kew, the celebrated Arnold Arboretum and many of the leading horticultural establishments of the Eastern States. An interesting report of this journey will be found in the *Kew Bulletin*, 1894, pp. 37–66. Being somewhat better in health in 1902, he accepted the position of a Delegate from the Royal Horticultural Society to the newly founded Horticultural Society of New York, on the occasion of the Conference on Plant Breeding and Hybridism. This journey proved very unfortunate for him; an acute attack of pleurisy bringing him almost to death's door.

After his return home his health improved considerably, and he was much in request as an adviser by owners of gardens and estates; but he soon found the travelling too arduous, and eventually declined all invitations.

The rest of his active life was largely devoted to the further investigation of the fauna and flora of the gardens he loved so well. Latterly it was the Fungi and Lepidoptera that almost exclusively engaged his attention, and nothing could dissuade him from spending hours in the damp underwood of the Queen's Cottage grounds in search of microscopic fungi. He even paid nocturnal visits in quest of moths. The additions to the Lepidoptera in the current volume of the *Bulletin* were mostly captured by him. A notable discovery was the Spurge Hawk moth, *Deilephila Euphorbiae*.

Close upon 2,000 species of fungi are known to occur in the gardens, and Nicholson alone collected about 500 of them. Among his discoveries the following were quite new to science: *Dasycypha abscondita*, Massee, *Humaria Nicholsonii*, Massee, *Pleuroascus Nicholsonii*, Massee and Salmon, and *Milowia amethystina*, Massee.

His later visits to the Gardens were in a Bath chair, and they were continued to within a week or two of his death.

Nicholson was a great reader, and he had a considerable and very miscellaneous collection of books, including many French, some German, Italian and Spanish, chiefly purchased of second-hand dealers; and at the death of the late Mr. Herman Herbst he inherited his books. On his rounds of the book-shops Nicholson always thought of Kew, and from time to time he discovered a book or a pamphlet not in the Kew library, which he either presented or reported, thus giving us an opportunity of purchasing. Among the books presented by him were the "Album Van Eeden," the "Album Benary," Victor Petit's "Parcs et Jardins des Environs de Paris," Kidder & Fletcher's "Brazil and the Brazilians," and the "Transactions of the English Arboricultural Society," from the beginning. He also presented the third, or 1844, edition of Loddiges' remarkable catalogue of Orchids, which contains 1916 numbers, with native countries, dates of introduction and references to figures of the species enumerated.

Finally, it may be said that George Nicholson was devoted to Kew, and discharged his duties to the establishment and to those under him in such a manner as to gain the esteem and admiration of all concerned. Many an old Kewite will remember with gratitude how much he owes to Nicholson's timely advice and unfailing readiness to encourage and assist.

Bibliography.

For many years Nicholson was a prolific contributor to the Horticultural Press, and his articles mostly contain original critical matter of permanent value. The following list is by no means exhaustive, as he often wrote anonymously, but it will give some idea of the scope and extent of his literary work.

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Lilies at Kew. Garden and Forest, 1893, vol. vi., p. 413.

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W. B. H.

Botanical Magazine for September.—The plants figured are: *Rhododendron Maddeni*, Hook. f., var. *obtusifolia*, Hutchinson, *Robinia Kelseyi*, Hort., *Agave Watsoni*, J. R. Drummond &

C. H. Wright, *Zaluzianskya maritima* Walp., and *Bulbophyllum galbinum*, Ridl. The *Rhododendron* is a new variety which was discovered in the mountains of north-east Manipur by Sir George Watt, who sent seeds to Kew in 1882. Like the type the variety has large white flowers, but it differs from it in its obtuse leaves and longer calyx-segments. *Robinia Kelseyi* is an attractive plant with rose-coloured flowers and pods which are conspicuous on account of their dense covering of long reddish gland-tipped hairs. The Kew plants were purchased from Mr. H. P. Kelsey, of Boston, Mass., in 1903. The *Agave*, which is probably Central American, was described for the first time in the *Kew Bulletin* for 1907, p. 322. The plant was purchased in 1906 from Mr. Justus Corderoy, Blewbury, Didcot, who obtained it originally from the Ghiesbreght Collection. At Kew it has produced neither seeds nor offsets. *Zaluzianskya* is a genus of showy-flowered Scrophulariaceous plants of 32 species, all of which are South African. The flowers which usually expand at night and are often fragrant have a long slender tube and a spreading limb. This in *S. maritima* is half an inch to three-quarters of an inch across, red or purple brown outside and white inside. The drawing was made from a specimen sent to Kew by Mr. W. E. Gumbleton, who also presented seeds to the gardens, which he obtained from Mr. Thorncroft of Barberton, Transvaal. The Kew plants died after flowering. *Bulbophyllum galbinum*, a native of the Malay Peninsula, resembles *B. Reinwardtii*, Reichb. f., but it has 2-flowered peduncles. It was presented to Kew, with other orchids, including some allied species of *Bulbophyllum*, by the Hon. Walter Rothschild.

Pestalozzia Cydoniae, *Evans et Dowge*.—Mr. I. B. Pole Evans, of the Transvaal Department of Agriculture, has forwarded to Kew some twigs of *Cydonia vulgaris*, showing warty outgrowths formed by large numbers of arrested adventitious roots. These outgrowths are caused by a hitherto undescribed species of fungus belonging to the genus *Pestalozzia*. Mr. Evans sends the following diagnosis of his new species for publication in the *Bulletin* :—

Pestalozzia (Monochaetia, *Sacc.*) **Cydoniae**, *Evans et Dowge*.—Acervuli minuti, nigri, globosi, primo immersi dein erumpentes, tubercula ampla nodulosa formantes. Conidia fusoidea, 3–4-septata, 18–24 × 6 μ, cellulis mediis fuligineis extimis hyalinis, apice setula unica plerumque obliqua ornata. Conidiophorae graciles hyalinae.

TRANSVAAL. In ramulis vivis *Cydoniae vulgaris, Evans*.

Para Rubber.—The third edition of Mr. Wright's useful book on the botany, cultivation, chemistry, and diseases of *Hevea brasiliensis* has been received. The work has been thoroughly revised, and is considerably enlarged.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 10.] [1908.

LIV.—CASCARA SAGRADA.

(*Rhamnus Purshiana*, DC.).

The drug, Cascara Sagrada, is furnished by the bark of two species of *Rhamnus*, *R. Purshiana*, DC. and *R. californica*, Eschsch., natives of Western North America.

Specimens of both species have been in cultivation in the Royal Botanic Gardens, Kew, for many years, and those of *R. Purshiana*, now form bushy trees of about 18–21 feet in height with a clean trunk of 4–5 feet in length. The specimens of *R. californica*, at Kew are bushes, and would not be likely to furnish a great quantity of bark. Cascara Sagrada was introduced into medicine some thirty years ago, and since that time there has been a rapid destruction of the wild source of supply.

The attention of Kew was drawn to the matter in a letter from Mr. F. R. S. Balfour, who has recently made some interesting journeys in the Western States of N. America with the object of studying the forests of those regions. In sending some seeds of *Rhamnus Purshiana* he wrote as follows :—

"I send you some seed of *Rhamnus Purshiana* gathered by me at the head waters of South Fork of Skokomish river, Olympic Mountains, Washington. It is from this tree that the medical 'Cascara Sagrada' (bark) is got, of which about 50 carloads were sent East from Washington and Oregon last year, proceeds of which amounted to $100,000. The trees are becoming rapidly exterminated except in remote places, and it occurs to me that an industry might be established in Western Ireland and Scotland for the growth here of the tree, which ought to flourish. I found it up to 40 feet high.

"Should you next year wish more seed, kindly let me know. I could without great difficulty get a large supply."

From the way in which *R. Purshiana* has flourished at Kew (*see* Plate 1) it seems not unlikely that it may be a suitable

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subject for introduction to the western coasts of the British Islands, and may also prove to be of value commercially since the local supply is becoming exhausted and plantations do not appear to have been started in America.

In order to test whether the bark of an English-grown tree would yield the drug in the same percentage and of as good a quality as that of the native samples, one of the Kew trees of about the size of the one shown in the plate was cut down for purposes of analysis.

Messrs. Burroughs, Wellcome & Co. very kindly undertook to examine the bark and to report the results of their investigation, and 5¼ lbs. of dry bark, the produce of the Kew tree, was sent in February last to Dr. H. A. D. Jowett, senior chemist of the Wellcome Research Laboratories, London, for analysis.

The bark sent was duly worked up into tabloids—some of which are now in Museum No. I—and it has been reported that "the present extract is undistinguishable in its action from that made from American Bark," and in a further letter from Messrs. Burroughs, Wellcome & Co., it is stated that "The physician, to whom your special Cascara was submitted, reported it to be equal to the average of tabloid products from bark grown in America."

Chemistry.

With regard to the chemistry of the drug Cascara, our knowledge is still somewhat confused and unsatisfactory. The history of the subject has been ably dealt with by Dr. Jowett, who has also done a great deal of work in attempting to discover the active principle of the drug. The following account has been extracted from the paper to which reference has been made.

The only definite principle which has been certainly isolated from Cascara bark is emodin, and in addition a small amount of a substance isomeric with emodin, melting at 183° C., but insoluble in ammonia. Glucose has also been found, and a substance which, on treatment with acids, yields syringic acid.

The bark contains about 2 per cent. of a fat yielding the alcohol rhamnol, which is identical with the alcohol obtained from Kô-sam seeds (*Brucea sumatrana*, Roxb.).

All attempts to obtain the bitter principle, an unpleasant and characteristic feature of Cascara bark, or derivates of it in a crystalline form were unsuccessful.

No difference could be observed between the chemical characters of the fresh (1 year old) or of the so-called mature bark (3 years old).

Beyond slight differences in the amounts of extractive, &c., the examination of *Rahmnus Purshiana* and of *R. californica* gave identical results.

Physiological experiments which were made for the purpose of locating the active principle of the drug, showed that emodin is not the active principle and exerts very little influence, if any, on the characteristic action of Cascara. The active principle or principles producing the aperient action of the drug are contained in that

CASCARA SAGRADA TREE IN SUMMER.
Rhamnus Purshiana, DC.

To face page 430.

FIG. 1. *Rhamnus Purshiana*, DC., in late Autumn.
FIG. 2. *R. Purshiana*, shewing shoots from the stool.

portion of the alcoholic extract which is soluble in water and precipitated by lead sub-acetate, and further, it is contained in that portion of the regenerated lead sub-acetate precipitate which is soluble in ethyl acetate. It has not been found possible to isolate a crystalline product from this extract, and therefore no clue has as yet been obtained as to the chemical nature of the active principle.*

The Tree.

The native home of *R. Purshiana* is on the Pacific slope of North America from Northern California northwards to Oregon and Washington; it is also found sparingly in Idaho and Montana. It is stated to vary considerably in size, in some places forming a shrub of 10–12 feet in height and in others it becomes a small tree 20–40 feet high with a trunk 1 foot or more in diameter.†

The average yield of a tree is about 10 lbs. of bark, and as 1,000,000 lbs. of the drug are required annually, some 100,000 trees have to be destroyed each year; a shortage of bark was reported in 1905.‡

The following note, which has been prepared by the Assistant Curator, gives an account of the trees of *R. Purshiana* in the Royal Botanic Gardens, Kew, one of which is shewn in summer and in winter condition in the accompanying plates.

The trees of *Rhamnus Purshiana* which are now growing in the Arboretum at Kew were raised from seed sent by Mr. Luther Burbank in December, 1891. The seeds, which had been collected in Sonoma Co., California, were sown on the 5th of that month and germinated at the beginning of the following March. The largest tree is now 21 feet high, 18 feet in the spread of its branches, and the trunk girths 24 inches. It should be mentioned that they are growing in the ordinary soil of Kew which is shallow and of a dry, sandy nature. Planted in a richer deeper soil, the trees would no doubt have been considerably larger. They usually form low spreading specimens each with a short trunk and a dense head of branches. (The tree shown in the Plates has been stem-pruned, and shows a more upright habit.) The bark is rather distinct and pretty by reason of the numerous short light-coloured fissures that traverse it longitudinally.

The species is undoubtedly quite hardy at Kew. All our trees passed through the great frosts of February, 1895, unprotected and without injury, and they are not likely to experience a severer test than that. They flower regularly in May, but the fruits, which are ripe in August, are not produced regularly or in any quantity. The fertility of home-grown seeds has not yet been tested, but seeds recently imported from the United States have germinated badly.

Of the seeds sent by Mr. F. R. S. Balfour only three germinated and all the rest appear to have been bad at the time of sowing.

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* Chemical investigation of Cascara Bark by H. A. D. Jowett. D. Sc. Paper No. 47. The Wellcome Chemical Research Laboratories.

† Report of the Commissioner of Agriculture, Washington, 1885, pp. 67, 68, and Plate III., *Rhamnus Purshiana.*

‡ Pharm. Journ. 1905, p. 323.

The three plants raised from seed, sown in January last, are now from 3-5 inches in height. A further consignment of seed was received from America and distributed to various private gardens in the West of Ireland and Scotland, but unfortunately nearly the whole of this consignment of seed appears to have been infertile.

The plant can probably be propagated by means of cuttings.

Plantations of *R. Purshiana* could apparently be treated as coppice. One of the Kew trees, now 17 years old, whose bark has been analysed, was sawn off at the ground level last spring and has sent up a crowd of shoots from the stump, some of which grew 4 feet high during the summer; they are shown in the inset to Plate 2.

Rhamus californica is represented at Kew by three distinct forms, viz. the type, var. *tomentella* with very tomentose young wood and leaves, and var. *oleifolia* with smaller leaves than either of the preceding. They are all distinct-looking evergreen shrubs and evidently quite hardy at Kew. They are of purely bushy habit, being considerably more in width than they are in height, and the largest is now about 6 feet high. *R. californica*, though it yields the drug Cascara Sagrada and flourishes in Kew, does not appear to be so suitable a subject for cultivation in Great Britain.

With regard to *R. Purshiana*, however, the evidence which has been given both from the clinical and cultural points of view seems to indicate that the cultivation of this species is worthy of consideration*; moreover, it seems likely that the demand for the drug will not diminish.

Explanation of Plates.

Plate 1. A tree of *Rhamnus Purshiana*, DC. 17 years old, grown from seed at Kew. From a photograph taken in summer of a tree 21 feet in height.

Plate 2. Fig. 1. The same tree in late autumn.

Fig. 2. A vigorous growth of shoots, which have have sprung from the stool of the tree cut down for analysis. The longest shoots are 4 feet in height.

LV.—DIAGNOSES AFRICANAE: XXVI.

981. **Muraltia parvifolia**, *N. E. Brown* [Polygalaceae]; affinis *M. rigidae*, E. Mey., ramis suberectis junioribus angulatis et floribus majoribus facile distinguitur.

Fruticulus parvus, compacte ramosus, floribus exceptis omnino glaber, subrigidus. *Rami* et ramuli suberecti, subconferti, primum conspicue angulati, demum subteretes. *Folia* alterna,

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* With regard to the market value of Cascara bark, it is reported in the *Chemist and Druggist* of December 5th, 1908, that fifty bags of good, thin bark, imported in 1906, were sold at the rate of 37/6 per cwt. The price, however, has been as low as 26/- and as high as 50/- per cwt,

erecta vel subadpressa, 2·5–5 mm. longa, 1–1·5 mm. lata, oblonga vel subobovato-oblonga, acuta vel mucronata, basi in petiolum brevissimum angustata, crassa, dorso bisulcata. *Flores* axillares, solitarii vel binis, pedicellati. *Pedicelli* 1·5 mm. longi. *Sepala* valde inaequalia; breviora 1–1·5 mm. longa; longiora 2 mm. longa, oblonga vel ovato-oblonga, obtusa, carinata, ciliata. *Petala* subaequalia, 4·5 mm. longa; 2 superiora linearia, obtusa, basi parce ciliata et intra parce pubescentia, alba; carina latissime biloba, alba crista purpurea.

South Africa. Worcester Div.; Karoo near Matjesfontein, Aug. 1905, *F. E. Weiss*, 2.

982. **Fagonia socotrana,** *Schweinf. in Bull. Herb. Boiss.* sér i. vii. 272 (1899) [Zygophyllaceae].

Var. **somalica,** *Sprague*; a typo sepalis minoribus pro rata latioribus, petalis brevius unguiculatis apice retusis muticis.

Pedicelli 4–5 mm. longi. *Sepala* ovato-elliptica, 3–3·5 mm. longa, 1·5–2 mm. lata, non ciliolata, alia breviter acute acuminata, alia acuta tantum. *Petala* obovata, leviter retusa, mutica, 5·5–6 mm. longa, 3·5–4 mm. lata, ungue vix 1·5 mm. longo.

British Somaliland. *Drake-Brockman*, 511, 514.

The sepals of typical *F. socotrana* are glandular-ciliolate, and the petals are conspicuously apiculate.

983. **Dichapetalum rhodesicum,** *Sprague et Hutchinson* [Dichapetalaceae]; affinis *D. argenteo*, Engl., a quo petiolis longioribus, foliis supra densiuscule pubescentibus, cymis laxioribus pro rata pauciforis recedit.

Frutex 60–70 cm. altus, ligno molli. *Ramuli* subteretes, sulcati, circiter 3 mm. diametro, ut petioli, stipulae et inflorescentia dense fulvo-tomentosi, internodiis 1·5–3 cm. longis. *Folia* oblongo-elliptica, oblongo-ovata vel oblongo-lanceolata, acute acuminata vel rotundata et mucronata, 5–10 cm. longa, 3–4 cm. lata, basi rotundata, discolora, supra viridi-brunnea, densiuscule pubescentia, subtus dense pallide grisco-viridi-tomentosa, marginibus leviter irregulariter undulatis, nervis lateralibus utrinque 5–7 supra leviter impressis subtus prominentibus, venulis supra inconspicuis subtus prominulis; petioli 3–4 mm. longi, planoconvexi. *Stipulae* subulato-lineares, 5–7 mm. longae, subacutae. *Cymae* axillares, laxiflorae, usque ad 3 cm. longae, bracteis linearibus 2 mm. longis. *Calycis* tubus 1 mm. longus; lobi obovato-oblongi, acuti, 5–6 mm. longi, 1·5–2 mm. lati, extra fulvo-tomentosi, intra pubescentes. *Petala* oblongo-obovata, alte bifida, 5 mm. longa, 2·5 mm. lata, extra longe pilosa, intra glabra. *Stamina* 4 mm. longa, filamentis planis, antheris in semicirculum arcuatis sursum spectantibus. *Ovarium* omnino superum, ovoideum, 3-loculare, rarius 2-loculare, extra dense villosum, loculis biovulatis; stylus 3·5-4·5 mm. longus, glaber, breviter 3-fidus, rarius 2-fidus. *Fructus* (an immaturus) ovoideo-globosus, 5 mm. longus, 4 mm. diametro, dense tomentosus.

Rhodesia. Gwaii Forest, *C. E. F. Allen*, 234.

984. **Harpullia (Majidea) Fosteri,** *Sprague* [Sapindaceae—Harpullieae]; affinis *H. zangubaricae*, Radlk., a qua floribus actinomorphis disco pentagono differt.

Folia 15–30 cm. longa; foliola 3–7-juga, opposita vel subopposita, oblonga vel lanceolato-oblonga, apice breviter obtuse acuminata, basi oblique cuneata petiolulis brevissimis, 5–9 cm. longa, 2–3 cm. lata, praeter nervum medium supra puberulum glabra. *Inflorescentia* circiter 13 cm. longa, subcorymbosa, ramis et ramulis ut pedicellis bracteis sepalis capsulisque velutino-pubescentibus. *Flores* monoici, in cincinnos dispositi quorum flos terminalis femineus ceteri masculi; bracteae ovatae, usque ad 1 cm. longae; pedicelli 6 mm. longi. *Sepala* 5, rarius 6, deltoideo-ovata, 3–3·5 mm. longa, 2·5–3 mm. lata. *Petala* nulla vel 1–2, lanceolata, utrinque dense pubescentia, usque ad 4·5 mm. longa, 1·5 mm. lata. ♂: *Discus* carnosus, pentagonus, 4 mm. diametro, intus crenulatus. *Stamina* 8, in crenulis disci inserta; filamenta subulata, 5 mm. longa. *Ovarii* rudimentum 1 mm. longum, pilosum. ♀: *Staminodia* 1·5 mm. longa. *Capsula* immatura, ultra 1 cm. longa, stylo persistente 3 mm. longo. *Semina* pilosa.

LAGOS. Oloke Meji, *Foster*, 49.

H. Fosteri is known at Oloke Meji under the native name "Ishin Oko." Though obviously allied to *H. zanguebarica*, it could not be placed in any of the subgenera of *Harpullia* as defined by Radlkofer in Engler & Prantl, Pflanzenfamilien, vol. iii. 5. p. 362. A specimen was accordingly submitted to Prof. Radlkofer, who agreed that its closest affinity was with *H. zanguebarica* and *H. madagascariensis*, and suggested that it should be placed in the subgenus *Majidea*, as the type of a new section. This involves alteration of the characters of the subgenus *Majidea*, which now differs from *Euharpullia* and *Otonychium* only in the hairy seed.

Subgenus Majidea, *Radlk.*, emend.

Flores actinomorphi vel zygomorphi bracteis foliaceis. Semina exarillata, pilosa.

Sectio **Goniodiscus**, *Sprague* (sect. nov.). Flores actinomorphi disco pentagono. Sp. 1, *H. Fosteri*, Sprague.

Sectio **Harpulliopsis**, *Radlk.* (sect. nov.). Flores zygomorphi disco unilaterali.

—— *Cossignia* sect. *Harpulliopsis*, Baill. in Adansonia, vol. xi. 1874, p 248; Hist. Pl. vol. v. 1874, p. 422.

Spp. 2, *H. zanguebarica*, Radlk., et *H. madagascariensis*, Radlk.

985. **Crassula Weissii**, *N. E. Brown* [Crassulaceae]; affinis *C. flabellifoliae*, Harv., sed multo minora, foliis subintegris vel obscure crenatis, floribus minoribus viridi-albis et pedicellis brevioribus differt.

Herba parva, tuberosa, 4–6 cm. alta, omnino glabra. *Tuber* 3–5 mm. diam. *Caulis* infra folia 1–1·2 cm. longus. *Folia* dua, opposita, sessilia, tenuiter carnosa, 1·4–1·8 cm. longa, 2–2·5 cm. lata, transverse subelliptica, basi latissime cuneata, integra vel obscure crenata. *Panicula* e basi ramosa, ad medium bracteis 2 oppositis rotundatis (foliis reductis) 3–5 mm. diam. et superne bracteis alternis minutis anguste oblanceolatis obtusis instructa. *Flores* subconferta. *Pedicelli* 1–2 mm. longi. *Sepala* ·75 mm.

longa, ovata, obtusa. *Petala* 2 mm. longa, 1 mm. lata, lanceolato-oblonga, acuta, virescente-alba. *Squamae hypogynae* anguste cuneatae, truncatae.

South Africa. Worcester Div.; Karoo at Matjesfontein, Aug. 1905, *F. E. Weiss*, 14.

986. **Kalanchöe latisepala**, *N. E. Brown* [Crassulaceae]; affinis *K. Dyeri*, N. E. Br., sed foliis sessilibus et floribus fere duplo minoribus facile distinguitur.

Herba succulenta erecta, 60 cm. alta. *Caulis* 1·3–1·5 cm. crassus, inferne glaber, superne (parte florifera) glanduloso-pubescens. *Folia* sessilia, usque ad 11–12 cm. longa et 8–9 cm. lata, obovata, apice obtuse rotundata, basi cuneata; inferiora irregulariter crenata vel subcrenato-dentata, plana, glabra, viridia; superiora (secundum pedunculum? vel partem floriferam) supra convexa, subtus concava, glanduloso-pubescentia. *Cymae* terminales, pluriflores, glanduloso-pubescentes, ramis 4–8 mm. longis. *Bracteae* parvae, elliptico-oblongae, apiculatae vel acutae. *Pedicelli* 5–10 mm. longi. *Calycis* tubus 4–5 mm. longus, lobi 7–10 mm. longi, 6 mm. lati, oblongi vel ovato-oblongi, acuti, virides. *Corolla* alba, extra glanduloso-pubescens; tubus 3–3·3 cm. longus, 4-angularis, basi leviter inflatus; lobi 4, patentes 1·2 cm. longi, 8–9 mm. lati, ovati vel elliptico-ovati, acuti, apiculati. *Stamina* superiora breviter exserta; antherae luteae. *Glandulae hypogynae* 6–7 mm. longae, lineares. *Carpella* 1·2–1·3 cm, longa; styli 2 cm. longi, exserti.

Tropical Africa. Nyasaland; raised from seed sent by *Mr. J. McClounie* to Kew in 1905, flowered in March, 1907.

987. **Felicia pusilla**, *N. E. Brown* [Compositae—Asteroideae]; proxima *F. tenera*, N. E. Br. (*Aster tener*, Harv.) omnino minora, capitulis duplo minoribus, ligulis involucro brevissime excedentibus differt.

Herba annua, 7–8 cm. alta, pauce ramosa, tenuiter pilosa. *Caulis* tenuis, internodiis 1–1·8 cm. longis. *Folia* opposita, 1·5–3 cm. longa, 2–5 mm. lata, spathulato-lanceolata, acuta vel obtusa, basi in petiolum longe attenuata. *Pedunculi* terminales, 1·5–3·5 cm. longi, graciles. *Capitula* 5 mm. diam., radiata. *Involucri* squamae subbiseriatae, aequales, 4 mm. longae, 1 mm. latae, lanceolatae, acutae, dorso parce pilosae. *Flores* omnes fertiles et pappo instructi; corolla radii ligulata, 3 mm. longa, apice recurva, coerulea, involucrum brevissime excedens; corolla disci 2·5 mm. longa, tubulosa, 5-dentata, lutea. *Achaenia* adpresse-pubescentia. *Pappi* setae scabridae.

South Africa. Worcester Div.; Karoo at Matjesfontein, Aug. 1905, *F. E. Weiss*, 15.

Well distinguished from all other species by its small size and the very short dark blue rays.

988. **Cyphia longifolia**, *N. E. Brown* [Campanulaceae]; affinis *C. persicifoliae*, Presl, foliis longioribus et floribus puberulis facile distinguitur.

Herba, 3·4–8·7 dm. alta. *Caulis* simplex, inferne glaber, superne puberulus ad inflorescentiam subtomentosus. *Folia* suberecta, sessilia, 5·5–13 cm. longa, 2–10 mm. lata, linearia, acuta, minute

denticulata, utrinque glabra. *Racemus* terminalis. 6–18 cm. longus, multiflorus. *Flores* nutantes vel subhorizontales. *Bracteae* 2–10 mm. longae, lineares vel filiformes, ciliolatae. *Pedicelli* 2–4 (inferiores interdum 4–7) mm. longi, puberuli vel tomentosi, basi bracteolis duobus 1·2 mm. longis onusti. *Calycis* tubus cum ovarium brevissime et latissime obconicus, 5-costatus, puberulus vel tomentosus; lobi 2–4 lin. longi, e basi ·5–1 mm. lati attenuati acuti, ciliati. *Corolla* bilabiata, extra puberula, intra glabra, lilacina vel tubo alba; lobi superiores ad medios leviter connati, linear-falcati, acuti, inferiores 9–11 mm. longi, superioribus paulo breviores. *Stamina* 5 mm. longa; filamenta dense pubescentia; antherae dorso appresse pubescentes apice barbatae. *Stigma* obtusa. *Capsula* globosa, 5–7 mm. diam., basi tantum ubi calyce adnata puberula, superne glabra.

South Africa. Griqualand East; Mount Malowe, 3000 ft., *Tyson*, 3092. Tembuland; Bazeia, 2000 ft., *Baur*, 576. Natal; Zwartkop, 4000–5000 ft., *Wylie in Herb. Wood*, 10139.

989. **Stapelia Marlothii**, *N. E. Brown* [Asclepiadaceae]; affinis *S. Asteriae*, Masson, sed corona exteriora brevissima et lobis interioribus e basi patulis distinctissima.

Caules erecti, basi decumbentes, 10–15 cm. alti, 1·3–2·5 cm. crassi, 4-angulati, pubescentes, angulis compressis. *Flores* solitarii (*Marloth*) prope basin caulorum enati. *Pedicelli* 2 cm. (vel ultra?) longi, velutini. *Sepala* 1 cm. longa, lanceolata, acuta, velutina. *Corolla* 10 cm. diam., extra velutino-puberula, intra leviter rugosa, ad apicem loborum pilis longis simplicibus villosa; tubus brevissimus, 1·5 cm. latus, pentagonus, ad angulos sulcatus; lobi 4·5 cm. longi, basi, 1·3 cm. lati, longe attenuato-lanceolati, acutissimi. *Coronae* lobi exteriores erecti, 2·5 mm. longi, oblongi, acuti, concavi; lobi interiores bipartiti, parte exteriora alaeformi 3 mm. longa, 2–2·5 mm. lata, late oblonga, apice obtusissima vel subtruncata, obscure denticulata; parte interiora e basi patula, 5 mm. longa, dorsaliter compressa, lineari-attenuata, apice acuta vel denticulata.

Rhodesia. Matopo Hills, *Marloth*, 3414.

990. **Crabbea acaulis**, *N. E. Brown* [Acanthaceae]; affinis *C. nana*, Nees, capitulis sessilibus, bracteis spinuloso-ciliatis, et floribus duplo majoribus differt.

Herba acaulis. *Folia* 6–8, rosulata, sessilia, subcrasso-coriacea, 4–6 cm. longa, 2–4 cm. lata, elliptico-lanceolata vel elliptico-ovata, obtusa, basi cuneata, supra glabra, subtus costa et interdum nervis parce setuloso-pilosa. *Capitula* 1–2, sessilia, pluriflora. *Bracteae* exteriores usque 2·5 cm. longae, 6–8 mm. latae, oblongo-lanceolatae, spinuloso-acuminatae, marginibus spinulis 1–2 mm. longis ciliatis, costa parce pilosa. *Calyx* fere ad basin 5-partitus, lobis linear-attenuatis, 1–1·3 mm. latis, lobo dorsali 1–1·1 cm. longo, caeteribus paulo brevioribus, pilis longis albis suberectis ciliatis. *Corollae* tubus 13 mm. longus, apice 5 mm. diam., anguste infundibuliformis, glaber; limbus subaequaliter oblique 5-lobus; lobis 4–5 mm. longis et latis, suborbiculatis, glabris, inferioribus subtus laxe pubescentibus; palato carinato. *Stamina* inclusa; antherae dorso pubescentes, apice minute apiculatae. *Stigma* orbiculato-ovata, acuta.

Transvaal. Jeppestown Ridges, near Johannesburg, 6000 ft. *Gilfillan in Herb. Galpin*, 6245.

991. **Isoglossa densa**, *N. E. Brown* [Acanthaceae]; affinis *I. origanoidi*, Lindl., bracteis multo angustioribus, linearibus vel lineari-lanceolatis, obtusis, marginibus apice involutis, nec planis nec dense villoso-glanduliferis, facile distinguitur.

Caules erecti, ramosi, inferne glabri, superne puberuli. *Folia* superiora (cum petiolis 2–4 mm. longis) 1·5–3 cm. longa, 7–14 mm. lata, subrhomboideo-ovata, breviter et obtuse acuminata, basi cuneata, supra glabra, subtus venis parce scabro-puberula, basi tantum ciliata. *Spicae* ad ramos terminales, 2–3 cm. longae, 1 cm. latae, densae. *Bracteae* inferiores foliis parvis simulantes, ceteres 6–10 mm. longae, 2 mm. latae, lineares vel lineari-lanceolatae, obtusae, marginibus superne involutae, cum bracteolis sepalisque pilis simplicibus ciliatae, dorso pilis glanduliferis laxe vel subdense obtectae. *Bracteolae* 6–7 mm. longae, 2 mm. latae, lineari-lanceolatae, acuminatae. *Sepala* 6–7 mm. longa, 1–1·5 mm. lata, lineari-lanceolata, acuminata. *Corolla* glabra, apice labiis tantum puberula, alba; tubus 4–5 mm. longus, calyce brevior; labia aequilonga, 6 mm. longa; labium superius oblongum, breviter et obtuse bifidum; labium inferius brevissime et obtusissime 3-lobum, palato profunde sulcato. *Stamina* 2, glabra; antherae loculi superpositi. *Capsula* glabra, basi stipitiformis, 1–2-sperma.

South Africa. East London Div.; near East London, *Wood in Herb. Galpin*, 3375.

992. **Vitex Fosteri**, *C. H. Wright* [Verbenaceae-Viticeae]; a *V. ferruginea*, Schumach. & Thonn., foliolis ellipticis petiolulis longioribus differt.

Rami quadrangulares, fulvo-villosi. *Folia* 5–7-foliolata; foliola elliptica, basi cuneata, apice breviter cuspidata, 8 cm. longa, 4 cm. lata, supra sparse puberula, subtus ad venis pubescentia, ad laminis minute denseque aureo-glandulosa, integra vel obtuse serrata; petiolus 8 cm. longus, fulvo-villosus; petioluli tenues, 1–2 cm. longi. *Calyx* aperte campanulatus, 7 mm. diam., extus dense villosus; tubus 4 mm. longus, ore subobliquus; lobi triangulares, 2 mm. longi. *Corollae* tubus 8 mm. longus, curvatus, medio constrictus, extus basi glaber, supra puberula, intus basi glaber, nitida, supra staminum insertionem pubescens; lobi patentes, ovati, 4 mm. lati; lobus anticus rotundatus, crenatus, 8 mm. diam. *Filamenta* robusta, pubescentia; antherae divergentes. *Stylus* glaberrimus.

Lagos. *Foster*, 34.

993. **Plectranthus Alleni**, *C. H. Wright* [Labiatae-Ocimoideae]; *P. stenophyllo*, Baker, affinis, calycis dentibus majoribus foliisque petiolatis subtus glabris differt.

Caulis erectus, rigidus, glaber, ad 16 cm. altus, 2 mm. latus. *Folia* oblonga, obtusa, basi longe attenuata, obscure crenata, utrinque glabra, subtus glandulis minutis impressis instructa, ad 10 cm. longa et 2·5 cm. lata; petiolus 1·5–3 cm. longus. *Racemus* terminalis, laxiflorus; pedunculus infra glaber, supra hirsuta;

pelicelli 4 lin. longi. *Calyx* hirsutus ; tubus campanulatus, 2 lin. longus ; lobus posticus ovatus, 2 mm. longus ; lobi caeteri e basi deltoideo rigide subulati. *Corolla* extus hirsuta, intus glabra ; tubus 4 lin. longus, leviter curvatus ; lobus anticus ovatus, concavus, 5 lin. longus, 3 lin. latus, obtusus ; lobi caeteri oblongi, 3–4 lin. longi. Filamenta glabra.

Rhodesia. Lukandu River, *C. E. F. Allen*, 471.

994. **Aristogeitonia**, *Prain*, gen. nov. [Euphorbiaceae] ; genus inter Phyllantheis ponendum, a generibus alteris quorum folia digitatim foliolata sunt calycis utriusque sexus segmentis 2-serialibus, florumque fasciculis ad axillas foliorum delapsorum glomeratis recedens.

Flores monoici, apetali. *Flores* ♂ : *Sepala* 6, 2-serialia, imbricata. *Discus* 0. *Stamina* 14–15, filamentis liberis ; antherae ovatae, loculis parallelis longitudinaliter dehiscentibus. *Ovarii rudimentum* insigne, 3-lobum. *Flores* ♀ : *Sepala* 6, 2-serialia, imbricata. *Discus* annularis, crenato-lobatus. *Ovarium* 3-loculare ; styli breves, patentes, plani, crassiusculi, obcordati, basi brevissime connati ; ovula in quoque loculo gemina. *Capsula* in coccos 3 2-valves dissiliens, endocarpio duriusculo crustaceo. *Semina* in coccis abortu saepissime solitaria, ovata ; testa crustacea, nitida.— *Arbor*. *Folia* alterna, 1-foliolata vel digitatim 2–3-foliolata, distincte petiolata ; foliola sessilia, integerrima, coriacea, penninervia ; stipulae distinctae, subulatae. *Flores* fasciculati ad axillas foliorum delapsorum glomerati.

A. limoniifolia, *Prain* (species unica).

Arbor, innovationibus parcissime puberulis. *Folia* petiolata petiolis puberulis valde inaequalibus ·5–4·5 cm. longis, nunc 1-foliolata nunc 2–3-foliolata foliolis glabris coriaceis, in eodem folio saepe inaequalibus ovato-lanceolatis acutis basi cuneatis margine integerrimis, 3–8 cm. longis, 1·25–3·5 cm. latis, nervo mediano distincto praesertim subtus, nervis secundariis 8–12-jugis subtus gracilibus supra vix manifestis ; stipulae subulatae, 6 mm. longae. *Perianthii segmenta* ♂ triangularia, acuta ; ♀ ovata, breviter acuminata, extra puberula, glomeruli floresque parvuli. *Capsula* 1·25 cm. longa lataque. *Semina* 8 mm. longa, 5 mm. lata.

Tropical Africa. Lower Guinea ; Angola, Loanda Dist., *Gossweiler*, 457 !

995. **Androstachys**, *Prain*, gen. nov. [Euphorbiaceae] ; genus inter Phyllantheis ponendum, nulli tamen adhuc descripto arcte affine floribusque masculis pro ordine inusitatis insigne.

Flores dioici, apetali. *Discus* 0. *Flores* ♂ : *Perianthium* e segmentis 2–5 bracteiformibus liberis compositum. *Stamina* plurima secus axin elongatum spiraliter disposita, filamentis imis distinctis perbrevibus recurvis, caeteris obsoletis ; antherae elongatae axi plus minusve approximatae, loculis distinctis connectivo adnatis longitudinaliter dehiscentibus. *Ovarii* rudimentum 0. *Flores* ♀ : *Perianthium* 5-partitum, lobis ovatis acuminatis imbricatis. *Ovarium* 3-loculare, sericeo-pilosum, stylis in columnam elongatam sericeo-pilosam connatis, stigmatibus 3 reflexis ; ovula in quoque loculo gemina. *Capsula* 3-dyma septicide in coccos demum

2-valves dissiliens, endocarpio crustaceo. *Semina* ovata, compressa; albumen carnosum; cotyledones planae, radicula multo latiores.—*Arbor* erecta, alta; ramuli plus minusve adpresse sericeo-pilosi, angulati, ad nodos articulati. *Folia* decussatim opposita, coriacea, petiolata; stipulae magnae, coriaceae, intrapetiolares simulac interpetiolares, folia juniora et flores in alabastro obtegentes, primum inter folia sejunctae demum omnino deciduae. *Flores* axillares, pedunculati, pedunculis sericeo-pilosis; ♂ in axillis singulis 3-ni, pedunculis nunc basi nunc fere omino coalitis, lateralibus centrali parum minoribus; pedunculi versus apicem petalis bracteiformibus extra hirsutis saepe bilobis spiraliter dispositis induti; perianthii segmenta in pedunculo centrali saepe 5 in pedunculis lateralibus 2–3 axin staminiferum plus minusve hirsutum obtegentia; ♀ in axillis singulis solitarii.

A. Johnsonii, *Prain* (species unica).

Arbor alta. *Folia* ovata, obtusa, margine integra, basi rotundata vel subcordata, supra glabra, subtus saepissime molliter sericeo-pilosa, 3–5 cm. longa, 2·5–4 cm. lata; stipulae 1·5 cm. longae, extra sericeo-pilosae; petioli 1 cm. longi, sericeo-pilosi. *Flores* lutei, pedunculis 1 cm. longis; ♂ axibus staminiferis 1·5–2·5 cm. longis; ♀ calyce 6 mm., stylo 6 mm. longis. *Capsula* depressa, 1·25 cm. longa, 1·5 cm. lata, endocarpio crustaceo. *Semina* 8 mm. longa, 6 mm. lata, 3 mm. crassa; testa brunnea, nitida.

TROPICAL AFRICA. Mozambique Dist.; Mosembe, *O'Neill*! Beira, *Johnson*, 283!

O'Neill gives the native name as 'Makrouss'; Johnson gives it as 'Zimbiti.' Both collectors state that the timber is valuable.

996. **Pycnocoma angustifolia**, *Prain* [Euphorbiaceae-Crotoneae]; species *P. Thonneri*, *P. Zenkeri* et *P. trilobatae* accedens; differt tamen foliis angustioribus, bracteis glabrescentibus, stylisque pro genere altissime connatis.

Frutex ramulis lignosis. *Folia* chartacea, glaberrima, laete viridia, oblanceolata vel anguste obovato-lanceolata, reticulata, apice acuta, margine integra vel minute remote dentata, versus basin in petiolum alatum brevem attenuata; lamina 14–20 cm. longa, 4–6 cm. lata; petiolus 1–2 cm. longus. *Flores* racemosi; racemi ad ramulorum apices axillares, rhachi 10 cm. longa bracteisque ovato-lanceolatis acutis planis 6 mm. longis parce puberulis vel fere glabris. *Flores* ♂ pedicellati, pedicellis puberulis vel fere glabris 1·5 cm. longis; alabastra globosa; sepala extra fere glabra, anguste ovata, acuta; stamina plurima filamentis longe exsertis 1·5 cm. longis. *Flores* ♀ in racemis terminales; sepala extra appresse puberula, anguste lanceolata; ovarium appresse hirsutum, 3-loculare, loculis singulis cornubus 2 conicis obtusis instructis; styli 3, in columnam fere glabram 1 cm. longam connati, superne per spatium 2–3 mm. longum tantum liberi. *Fructus* non visa.

TROPICAL AFRICA. Upper Guinea; Liberia, neighbourhood of Kakatown, *Whyte*!

997. **Tragia (Tagira) Scheffleri**, *Baker* [Euphorbiaceae-Crotoneae]; species *T. augustifoliae*, Benth., affinis, foliis brevioribus latioribusque racemis densioribus bracteis augustioribus differt.

Caulis gracilis, volubilis, pubescens. *Folia* manifeste petiolata, ovata, acuta, argute serrata, basi distincte cordata, 5–7 cm. longa, 2·5–4 cm. lata, membranacea, utrinque parce hirsuta. *Racemi* densi, multiflori, axillares, breviter pedunculati; bracteae lineares; pedicelli alabastris breviores. *Alabastra* globosa, glabra, 1·25 cm. longa. *Sepala* floris foeminei 3, ambitu orbicularia, demum 7–8 mm. longa lataque, alte palmatim laciniata, laminae parte indivisa orbiculari, laciniis 12–15 lanceolatis hispidis.

TROPICAL AFRICA. Usambara, Nquelo, *Scheffler*, 47 !

998. **Gasteria Huttoniae**, *N. E. Brown* [Liliaceae-Aloineae]; affinis *G. Croucheri*, Baker, sed foliis duplo latioribus et floribus duplo brevioribus conspicue differt.

Folia laxe rosulata adscendente-patentia, 40–45 cm. longa, basi 18–30 cm. lata, superne attenuata, ad apicem acutam vel obtusam 2·5 cm. lata, oblique carinata, ad carinam 4–5 cm. crassa, marginibus cartilagineo-denticulatis, utrinque viridia maculis obscure alboviridulis zonatim variegata. *Pedunculi* laxe paniculatim ramosi, 1·36–1·5 m. alti; rami 40–90 cm. longi, racemosim multiflori. *Flores* penduli. *Bracteae* 4–18 mm. longae, membranaceae, deltoideo-subulatae vel e basi deltoideo-ovato subulato-acuminatae albidae. *Pedicelli* 3 mm. longi. *Perianthium* 2–2·2 cm. longum, curvatum, tubulosum, basi ovoideo-inflatum, 5–5·5 mm. diam., roseo-miniatum, superne cylindricum, pallide roseum, lobis viridi-carinatis. *Stamina* inclusa; antherae luteae.

CAPE COLONY. Stutterheim Div.; Ripplemead, near Kabousie, *Mrs. C. Hutton*.

Described from a living plant sent to Kew by Dr. Schönland in June 1906, which flowered in August 1907 and 1908.

999. **Dasystachys leptoneura**, *C. H. Wright* [Liliaceae-Asphodeleae]; a *D. nervata*, C. H. Wright, pedunculo breviore, foliis pedunculisque pubescentibus differt.

Radicular anguste fusiformes. *Folia* oblonga, basi late vaginantia, acuta, 15 cm. longa, 10–15 mm. lata, membranacea, supra minutissime puberula, subtus ad nervos dense pubescentia, marginibus ciliatis. *Racemus* 12 cm. longus; pedunculus 3 cm. longus; bracteae scariosae, e basi late lanceolato longe cuspidatae, floribus superantes. *Perianthii* segmenta oblonga, obtusa, 4·5 mm. longa, 1·5 mm. lata, membranacea, tenuiter unicostata. *Filamenta* perianthio paullo longiora, tenues; antherae oblongo-lanceolatae, basi cordatae, 3 mm. longae, prope basin dorsifixae. *Ovarium* 1·5 mm. longum, 2 mm. in diam., viride; stylus filiformis.

BRITISH CENTRAL AFRICA. Nyika Plateau; Nacheri, 2380 m., *McClounie*, 89.

1000. **Sporobolus Schweinfurthii**, *Stapf* [Gramineae]; affinis *S. marginato*, Hochst. ex A. Rich., sed panicula haud divaricata, gluma superiore tenuiter acuminata, caryopsi majore elliptico-oblonga humefacta mucilaginem exudenti distincta.

Culmi subrobusti, erecti, 1 cm. alti, 4-nodi, internodiis superioribus exsertis. *Foliorum* vaginae subarctae, glabrae, laeves; ligula ad lineam ciliolatam reducta; laminae lineares, longe tenuiterque attenuatae, ad 25 cm. longae, 3·5–5 mm. latae, planae, glaucae,

supra scaberulae, infra laeves, ad margines serrulatae vel inferne fimbriatae. *Panicula* oblonga, erecta, 30 cm. longa, 4–6 cm. lata, laxiuscula ; rami primarii 10–6-ni., verticillati, oblique erecti, ad 10 cm. longi, basi excepta ramulosi, filiformes, laeves vel superne scabridi, secundarii breves, haud divaricati ; pedicelli quam spiculae breviores vel brevissimi. *Spiculae* purpurascentes, lanceolato-oblongae, 2·2–2·5 mm. longae. *Glumae* admodum inaequales, inferior hyalina, anguste oblonga vel lanceolata, subacuta, spiculam mediam paulo excedens, superior lanceolata, tenuiter acuminata, 1-nervis, valvam paulo excedens. *Valva* lanceolata, acuta vel subacuminata, 1-nervis ; palea paulo brevior. *Stamina* 3 ; antherae 1·2 mm. longae. *Caryopsis* elliptico-oblonga, 1·5 mm. longa, obtuse quadrangularis, compressa ; pericarpium rigidum, dehiscens. *Seminis* testa humefacta mucilaginosa ; endosperma opacum.

Tropical Africa. Bahr-el-Ghazal district ; Niamniam country, by the Ibba River, near Nganye, *Schweinfurth*, 3971.

LVI.—THE NELSON DISTRICT OF NEW ZEALAND.

The following letter descriptive of a journey in the Nelson District of New Zealand, by Capt. A. A. Dorrien-Smith, has been forwarded by him at the request of the Director for publication in the *Bulletin* :—

An Account of a Trip to the Nelson District of New Zealand in January, 1908.

I left Nelson on 16th January by a small steamer to Motueka, which is the centre of a considerable fruit-growing area, about two hours steam in a N.W. direction. On arrival I set off to drive 29 miles to a farmhouse occupied by Mr. Stebbings, who is in the habit of accommodating travellers and provides the necessary pack-horses, &c., for beyond his house there are no roads, mountain tracks only being available. It was after dark when I started the drive up, which was very fine, as the forest in the hills away to our right front was all ablaze, and a great cone-shaped mountain in particular was red-hot and looked like a vast volcano. This we passed some miles to our right and north and arrived in a narrow valley, which also was burning fiercely, the great trees crashing down the mountains and starting the rocks and stones at times created a terrific roar. The driver of the trap feared our way up the mountains might be impeded by the burning fallen logs, and on arrival at the farmhouse, where I found Mr. F. G. Gibbs and three others, it proved to be the case. This was a nuisance, as it meant delay. However, the next morning, having given up all hope of getting the pack-horses through, we started up the track to Mount Arthur, about seven miles, and returned the same day, leaving men to clear the track for the horses. On our return we found that the men had cleared the track, and as it turned out I think we could have got through with the horses and thus saved a long tramp. Anyway, the walk through the bush was most interesting when once we had got

clear of the burnt part. The forest hereabouts is chiefly composed of Beech, *Fagus fusca* being predominant and of enormous size. The other forest trees were *Dacrydium cupressinum* (Rima), *Podocarpus dacrydioides*, white pine, *P. spicatus* (Matai), *P. ferrugineus* (Miro), while the smaller trees were represented by *Carpodetus serratus*, *Fuchsia Colensoi*, *Hedycarya arborea*, *Aristotelia racemosa*, while on a limestone crag grew *Metrosideros lucida*. Among the smaller shrubs and underscrub I noticed *Drimys colorata*, with its beautiful green, yellow and red-coloured foliage, *Brachyglottis repanda*, and, along the streams, *Senecio Hectori*, which was in full flower and very lovely—it is one of the best of the New Zealand Senecios—while tree ferns and other ferns were fairly plentiful. At about 3000 ft. I noticed scarlet patches on the *Fagus*, and these turned out to be the scarlet-flowered mistletoe (*Loranthus*), a lovely sight, which as we got higher became more frequent and perfectly gorgeous. At about 4000 ft. the beech became smaller, and the forest became of a more scrubby nature. *Fagus Menziesii* became the predominant beech, and I met for the first time *Dracophyllum Traversii*, a magnificent tree, 15 to 20 ft. in height, with a lovely red stem and foliage like that of *Cordyline;* its branches spread upwards from the main stem in most beautiful curves like an ever-branching candelabrum, and it was in full flower.

I also saw many other plants of great interest, among them *Panax lineare*, *Olearia lacunosa*, *Senecio elaeagnifolius*, *Ourisia macrophylla*, *Phyllocladus alpinus*, *Astelia nervosa*, *Pratia angulata*, *Pentachondra pumila*, *Senecio gemminatus*, and *S. Bidwillii*. An ascent of about 500 ft. more brought us out of the forest, and immediately the Celmisias appeared, and so various were they that one did not know which one to turn to first; they were in full flower and very lovely. Here the chief varieties were *C. incana* and *C. Dallii*, and while advancing up the open slopes of the mountain different species of *Veronica*, *Aciphylla Colensoi* and *A. squarrosa* were at once apparent. The rain which had been threatening for some time now came on, and the whole mountain was enveloped in mist, so that it became advisable to retrace our steps, as a night out would have been exceedingly unpleasant, so we arrived back at the farm about 6 p.m., and my feet were not sorry to get in even if I was reluctant to leave the flowers.

We found the track had been cleared of the fallen logs, and next morning we set off at daylight with the pack-horses up the track again, passed the turning to Mount Arthur to our left, and headed for the Cobb Valley by a bridle track; on the way I got seed of *Olearia lacunosa*, and saw some fine specimens of *Todea superba*. The whole way lay through the beech forest, which was very lovely, but the tramp was rather tedious, being up and down rather violent hills all the way. At last, about 4 p.m., we came out into an open glade covered with Celmisias, and the beech trees all aglow with the scarlet-flowered mistletoe; it was a magnificent sight, and brighter by far than any *Metrosideros*. This glade led us down into the open Cobb Valley, and after going up it some three miles we came to a bushman's hut, where we stayed the night. I preferred the ground to the boards of the hut, and slept outside and very soundly. The chief plants other than those already mentioned

were *Pittosporum rigidum*, a plant more distinguished as a botanical curiosity than anything else, *Dacrydium Bidwillii*, and others; also *Hymenanthera dentata*, *Enargea marginata*, *Wahlenbergia saxicola*, and *Pimelia prostrata*.

The next day we pushed on about five miles only, and pitched our camp. The Cobb Valley is most interesting because, in the first place, it is practically unknown except to surveyors, and, with the exception of Mr. F. G. Gibbs, no botanist had been in it. It is a broad, glacial valley with a sluggish river flowing through it, instead of the violently gorged valleys and rapid rivers which are the prevalent characteristic of the country. Here was a beautiful U-shaped valley half-a-mile broad, grassed and fertile, but boggy in places; the mouth is dammed by a hard vein of quartzite, which is the cause of the original shape being maintained. There are fine examples of 'roche moutonnè' and other glacial evidences. Our camp was pitched about six miles from the head of this valley, which is dominated by Mount Cobb. The surface of the valley was in places carpeted with a fine species of *Bulbinella*, which seems quite distinct from *B. Hookeri*, as it is in every way a finer thing, but not so handsome as *B. Rossii* of the Auckland and Campbell Islands. In other places were masses of a white-flowered Gentian, which as yet is classed under *Gentiana patula*, though it differs from that species in many respects. The bush patches in the valley and their plant associations were most interesting, among them being *Aristotelia fruticosa*, *Gaya Lyallii*, *Coprosma cuneata*, *C. foetidissima*, *Pittosporum rigidum*, and generally tussocks of *Danthonia Raoulii* scattered about. I found *Veronica salicornioides* growing in this valley 7 ft. high. I got into a bush which was well over my head, but Cheeseman in his book says it attains a height of 3 ft. only. The side slopes of the valley are covered in beech forest, with much of the usual superb undergrowth missing. *Fagus Menziesii* here seemed predominant, and I was able to obtain some fine photographs of individual specimens. There also grows in this valley *Pittosporum patulum*, a very remarkable and distinct species, of which I have several plants. It occurs very rarely elsewhere in New Zealand, and practically only extends for four miles along the Cobb at the edge of the forest; from the juvenile form one would never guess its parental origin.

From our camp we made expeditions up the "walls" of the valley to the heights above, and always something interesting cropped up. For the first 1500 ft. we passed through beech forest, then came *Danthonia Raoulii* meadows and dwarfing bush with open glades, and in these *Celmisia Dallii*, *C. incana*, and *C. Traversii* were magnificent beyond description. The latter is distinguished by its shining, bright-green leaf, with purple mid-rib on the upper surface, while the under surface is covered with a soft, brown tomentum, the leaves being from 6 to 16 inches long and 1½ to 2½ inches broad. We caught them in their full glory, alas, rather too early for seed; but still I have a good assortment one way and another, and plants as well. In the drier places on the mountains we found *Celmisia spectabilis*, *C. laricifolia*, *C. hieracifolia*, *C. rupestris*, *C. bellidioides*, *C. Gibbsii*, and plenty of *C. coriacea*, but not so fine as in other localities.

Senecio Lyallii, var. *schorzonerioides*, was growing in great abundance on the shady, moist slopes of the mountain, and this also has a daisy flower with a yellow eye, and forms a mass of white. There are so many "daisy" flowers about that it becomes rather monotonous, as they are very much in evidence and so dwarf the significance of the rest of the mountain flora.

Whilst making an excursion up the hills opposite Mount Cobb on the East side of the valley, we came across the rare *Senecio Adamsii*, which was growing preferably among the larger stones of the shingle cliffs in great profusion. On the following day we attacked Mount Cobb itself, a fine bold mass of rock on the face of which were outlined the most weird distortions of the strata. There are patches of forest about its base composed for the most part of *Fagus* and *Dracophyllum Traversii*, and we found a peculiar stiff glaucous-leaved *Veronica*, a form of *V. elliptica*, which spends its winter apparently under the snow for it was much beaten down by pressure, and indeed we found some growing on a ledge where the snow had not melted; and close by this we discovered the most lovely *Myosotis* I have ever seen; I was first attracted by its scent and then saw it above me on a ledge of rock underlying a steep cliff where the sun would not penetrate after 10 a.m., even in summer. It proved to be *Myosotis macrantha*, var. *pulchra*, the flowers are, in the young stage, brownish-orange with a shade of green, and in the later stage lighter and more yellow. We found many other plants of great interest such as the dwarf *Dacrydium laxifolium*, *Podocarpus nivalis*, Veronicas, *Dracophyllum rosmarinifolium*, *D. Kirkii*, Geums, Craspedias and *Ranunculus Monroi*, *R. geraniifolius* and *R. insignis*.

We started to return on Saturday the 25th viâ Mount Peel and the Mount Arthur tableland; it was a glorious day, and from Mount Peel I saw Mount Tapuaenuka in the Kaikora Mountains which was close to where I had been staying for some time in the Marlborough district. As we proceeded over the tableland the scarlet mistletoe was more gorgeous than ever and after about a 23 miles tramp we arrived at the Flora-stream camping ground by sundown, having sent the pack-horses by a shorter route. We stayed there the night leaving five miles to be done the next morning back to Stebbing's farm. I obtained a fine collection of plants but almost lost the lot for, when we had proceeded nearly to the bottom of the track and arrived at where the forest was burning, we found more huge logs strewn in our path and a way had to be carved with axes out of one huge log to admit of the horses passing. The second horse, on which the plants were loaded, caught its pack in the side of the cut and was thrown with one leg over the precipice; it looked like losing horse and all, but luckily the horse remained quiet and we were able to cut the packs adrift and get the beast clear.

The other difficulties were circumvented, but not before the packs were off-loaded and transported by hand to where the track again became clear. After this no more difficulties were met with and so one of the most interesting and delightful trips I have ever made came to an end and we all arrived safely back in Nelson after ten days' absence.

LVII.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS LI.

501. **Berberis parvifolia**, *Sprague* [Berberidaceae]; affinis *B. dictyophyllae*, Franch., a qua omnibus partibus permulto minoribus, ramis puberulis, floribus plerumque fasciculatis, glandulis petalorum minus elongatis recedit.

Rami cinerei, puberuli. *Spinae* gracillimae, mediae circiter 1 cm. longae. *Folia* oblanceolata vel anguste obovata, 5–10 mm. longa, 2–2·75 mm. lata, spinuloso-apiculata, in basin sensim angustata, integra vel spinuloso-dentata, exsiccando brunneola crebre prominenter reticulata. *Flores* 1–4-fasciculati, pedicellis circiter 5 mm. longis. *Sepala* exteriora ovata usque elliptica, 2–2·5 mm. longa, 1·3–2 mm. lata, interiora late elliptica, 3·5 mm. longa, 2·5–3 mm. lata. *Petala* obovata, 2·75 mm. longa, 1·75 mm. lata, trinervia nervis a basi distinctis vel fere, glandulis valde discretis ellipticis circiter 0·3 mm. longis 0·4 mm. supra basin sitis. *Stamina* 2 mm. longa. *Pistillum* via 2 mm. longum, ovario paulo ultra 1 mm. longo, stylo circiter 0·3 mm. longo; ovula 4. *Bacca* ignota.

Western China. *Wilson*, 3154*a*.

502. **Boschia Mansoni**, *Gamble* [Malvaceae]; species a *B. Griffithii*, Mast., et *B. excelsa*, Korth., floribus et fructu multo majoribus et columna staminali longissima differt: prima facie ob columnam staminalem longam ad genus novum pertinere videtur sed antheris congestis unilocularibus poro unico terminali dehiscentibus et aliis notis hinc referendam arbitramur.

Arbor magna; ramuli graciles foliisque subtus calycibus et ovariis dense lepidoti; squamae stellatae, peltatae, argenteo-fuscae. *Folia* alterna, integra, elliptico-oblonga, apice abrupte longe acuminata, basi rotundata vel fere cordata, supra viridia, lucida, infra lepidota, 15–20 cm. longa, 4–6 cm. lata; costa gracilis ad apicem in mucronem brevissimum producta, nervi propter squamas densissimas perobscuri, utrinque 12–15; petiolus 1·5–2 cm. longus, supra crassus, infra gracilior. *Flores* magni, 5–7·5 cm. longi, pedunculis crassis ad ramos fasciculatis; bracteae 2, ovatae vel ovato-oblongae, ad basin connatae et calycem amplectentes, extra lepidotae, intus glabrae, 2 cm. longae, 1·5 cm. latae. *Calyx* tubuloso-campanulatus, basi ventricosus extra densissime lepidotus, intus glaber, 2 cm. longus; lobi 5, ovati, acuti, tubo aequilongi. *Petala* 5, rubra, spathulata, 3–3·5 cm. longa, 1–1·5 cm. lata, extus ad ungues parce lepidota et pubescentia, intus glabra. *Columna staminea* 3–4 cm. longa, superne in fasciculos 5 divisa, fasciculis 1–2 cm. longis. *Antherae* cylindrico-globosae, 1-loculares, poris terminalibus dehiscentes. *Ovarium* oblongum, angulatum, spinis multis squamas peltatas fimbriatas ferentibus dense tectum; stylus gracilis, pubescens, columna staminea aequilongus; stigma parvum capitatum; loculi 5, ovulis plurimis superpositis ex angulo interiori loculorum ortis erectis. *Fructus* globosus, apice

depressus, ad 5 cm. longus et 6–7 cm. diametro, spinis subulatis curvatis pubescentibus 12–13 mm. longis densissime tectus; pericarpium crassum, gummiferum. *Semina* (nondum matura) plurima, 12–13 mm. longa, hilo conspicuo, arillo magno succulento.

BURMA. At Papua, Daywin Road, Amherst, *F. B. Manson*; collected in April, 1905.

Vernacular name *Taw duyin* or "wild durian," Burm.; *Turimi*, Karen.

503. **Acer Osmastoni**, *Gamble* [Aceraceæ]; species foliis plerumque trilobis; ex parte ad *A. laevigatum*, Wall., speciem foliis indivisis, ex parte ad *A. Campbellii*, Hook. f. et Thoms., speciem foliis 5–7-lobis accedit; ab hac samaris minus divergentibus ab illa petiolis multo longioribus differt.

Arbor magna, ad 30 m. alta; ramuli teretes, glabri, rufescentes, graciles. *Folia* decidua, chartacea, opposita, juniora rufescentia, aliquando indivisa; matura in dimidio superiore 1–3-loba, basi rotundata vel paullo cordata, lobis erectis ovato-lanceolatis longe caudato-acuminatis acute serratis, 12–15 cm. longa, 6–8 cm. lata; supra glabra, infra etiam praeter nervos et floccos in axillis nervorum glabra; costae 3, ascendentes, nervis et reticulatione conspicuis; petioli graciles, 1–2 cm. longi. *Cymae* pedunculatae, in paniculam terminalem 7–10 cm. longam dispositae; pedunculi 5–10 mm. longi; bracteae minutae, subulatae; pedicelli graciles, 2–8 mm. longi. *Flores* parvi, polygami, viridescentes. *Sepala* 5, membranacea, inaequalia, ovato-acuminata, pallide flava, 5-nervia, ciliata, intus hirsuta, 2–8 mm. longa. *Petala* 5, alba, ovato-orbicularia, crenata, glabra, 1·5–2 mm. diametro. *Discus* annularis, integer vel crenatus. *Stamina* 8, intra discum inserta; filamenta gracilia, subulata; antherae oblongae, emarginatae, minute papillosae. *Ovarium* 2-loculare, sericeo-villosum; stylus gracilis; stigmata 2, recurva, torta; ovula in quoque loculo 2, pendula. *Fructus* ex samaris 2, in angulo recto divergentibus; alae rectae, apice rotundatae, basi contractae, venosae; semen in quaque samara unicum.

INDIA: in the Sikkim Himalaya at 6–7000 ft., at Darjeeling, Tonglo, Rangirún and other localities in 1904, *B. B. Osmaston*; also at Darjeeling in 1879, *Gamble*, in leaf only.

Mr. Osmaston thought this species to be probably a hybrid between *A. laevigatum* and *A. Campbellii* but its wide distribution in the district seems against this supposition, although when comparing together specimens of the three species it seems a natural one.

504. **Cynometra Bourdilloni**, *Gamble* [Leguminosae-Caesalpinieae]; ad *C. Beddomei*, Prain, et *C. inaequifoliam*, A. Gray, foliolis 3-jugis accedit, sed foliola multo minora et fructus diversus.

Arbor pulchra, ad 18 m. alta. et 45 cm. trunci diametro, cortice laevi nigro-viridi; ramuli sinuati, sparse lenticellati, fere nigri. *Folia* persistentia, alterna, paripinnata; rhachis cum petiolo 3–4 cm. longa; foliola 3-juga, opposita, sessilia, integra, ovato-spathulata, apice emarginata, basi cuneata inaequalia, supra nitida, subtus fere glauca et saepe glandulis nigris ornata, 2·5 ad 3·5 cm. longa, 0·75 ad 1·5 cm. lata; costa conspicua, basi incrassata

rugosa ; nervi primarii inconspicui, utrinque 6–7, margines versus reticulatione connexi. *Flores* albi, in racemos axillares densos 1·5 ad 2 cm. longos dispositi ; racemi in axillis bini, ad basin perulis multis late-ovatis paleaceis áureo-fulvis suffulti ; rhachis fulvo-villosa, angulata ; bracteae perulis similes ; pedicelli 3–4 mm. longi ; bracteolae fulvae, spathulatae. *Calyx* spathaceus, irregulariter 3–4-lobatus, ad 3 mm. longus. *Petala* 5, aequalia, oblongo-spathulata, angusta, glabra, 4 mm. longa. *Stamina* 10, 5 paullo breviora ; filamenta gracilia, glabra, 6–8 mm. longa, antherarum loculis parallelibus. *Ovarium* ovoideum, densissime fulvo-villosum, sensim in stylum attenuatum ; stylus superne glaber, stigmate obliquo obscure bilobo ; ovula 1–2. *Legumen* reniforme indehiscens, medio aequaliter constrictum ; 1·5 cm. longum, 2 cm. latum ; pericarpio crasso brunneo. *Semen* unicum, magnum, legumini conforme ; testa irregulariter fracta ; cotyledones crassissimae, supra et infra profunde fissae, radicula conica.

South India. Banks of the Parapár river, Travancore, 150 m., *T. F. Bourdillon.*

This species may be the same as that collected on the S. Ghâts of the Nilgiris by J. S. Law in 1892, of which specimens are in the Kew Herbarium. But the leaflets of Law's specimens are bluntly acuminate at the apex and very deeply emarginate. It flowers in February and March ; fruits in July and August.

505. **Cotyledon lateralis,** *N. E. Brown* [Crassulaceae] ; species distinctissima, cymis patentibus axillaribus folia vix excedentibus et corolla viridi-lutei facile distinguitur.

Caulis brevis, 3–4 cm. crassus, simplex. *Folia* 8–11 cm. longa, 1·6–1·8 cm. lata, 4–5 mm. crassa, lineari-ligulata, basi levissime dilatata, plana, acuta, mucronata, glabra, laetevirentia, sublucida, nec glauca, numerossima, in rosulam 22–25 cm. diam. dense conferta, superiora erecto-patentia, inferiora deflexa. *Cymae* ex axillis inferioribus enatae, pedunculatae, horizontaliter patentes, folia aequantes vel vix excedentes, compactae vel subdensae, multiramosae, floribus 80–130. *Pedunculi* 6–8 cm. longi, 4–5 mm. crassi, pallide virentes, apice tantum bracteiferi. *Bracteae* patentes, 4–9 mm. longae, basi 1·5–5 mm. latae, deltoideo-lanceolatae vel deltoideo-ovatae, acuminatae, basi cordato-amplexicaules, glabrae, laete virentes. *Pedicelli* 4–7 mm. longi, glabri, virentes. *Calyx* 5 (siccate 4) mm. longus, 5-lobus, basi cupularis, glaber, laete virens ; lobi erecti, 3 mm. longi, deltoideo-attenuati, acuti. *Corolla* 10 (siccate 8·5–9) mm. longa, 4 mm. diam., subcylindrica, obtuse pentagona, glabra, viridi-lutea ; segmenta erecta, acuta, fere ad medium connata. *Stamina* inclusa ; antherae luteae. *Carpella* pallide virescentia.

Origin unknown, probably a native of Mexico or adjacent regions. Flowered at Kew during the summer of 1908.

635 506. **Wrightia sikkimensis,** *Gamble* [Apocynaceae]: *W. tinctoriae,* R. Br., foliis et fructu affinis sed floribus coccineis et praecipue corollae appendicibus inaequalibus dentatis nec fimbriatis differt.

Arbor parva ; ramuli teretes, purpurei, lenticellis sparsis notati. *Folia* membranacea, cyaneo-viridia, elliptico-lanceolata vel

obovata, apice obtuse cuspidato-acuminata, basi cuneata, utrinque glabra vel nervis infra pubescentia, 8–12 cm. longa, 3–5 cm. lata ; nervi utrinque 10-12, marginem versus parallele curvati ; petiolus circiter 5 mm. longus, sulcatus. *Cymae* terminales, corymbosae, puberulae, subsessiles, ad 5 cm. longae et latae, dichotomo-ramosae ; bracteae parvae, ovato-acutae, caducae; pedicelli graciles, 10–12 mm. longi ; alabastra conoidea. *Flores* coccinei. *Calyx* parvus, 5-partitus ; lobi orbiculati, ciliati, extra pubescentes, 1–2 mm. longi ; glandulae 5, lobis fere aequilongae, crenulatae. *Corollae* tubus brevis, vix 1 mm. longus ; lobi lanceolati, utrinque fulvo-pubescentes, 8–12 mm. longi. *Coronae* appendices 10, glabrae, oblongo-lanceolatae, integrae vel 2–3-fidae, 5 corollae lobis oppositae, 6–7 mm. longae, et 5 alternae, vix 3 mm. longae. *Antherae* sagittatae, utrinque puberulae, filamentis et connectivo crassis. *Ovarium* 2-carpellatum, glabrum ; stylus gracilis, apice dilatatus ; stigma obtusum. *Folliculi* distincti, glabri, graciles, curvati, apice cohaerentes, ad 25 cm. longi, vix 5 mm. lati. *Semina* carnosa. *Holarrhena* sp. Gamble in Darj. List of Trees, &c., ed. 1. 55. *Wrightia coccinea*, Gamble in Darj. List, &c., ed. 2. 56, non Sims ; Brandis, Indian Trees, p. 461?

INDIA. In the outer hills of the Sikkim Himalaya up to 1220 m. *Gamble*, 574, 769, 3210 (1876) ; below Kurseong, *Brandis* (1879).

507. **Columnea (Eucolumnea) guatemalensis**, *Sprague* [Gesneraceae] ; affinis *C. glabrae*, Oerst., a qua calycis lobis angustioribus sursum attenuatis superne intra sanguineis recedit.

Ramuli graciles, tetragoni, leviter alati, exsiccando pallide cinerei, 1·5–3 mm. diametro, glabri, novelli tantum longiuscule pilosi. *Folia* oblongo-lanceolata, basi obtusa vel subrotundata, apice subacuta, 2–2·5 cm. longa, 8–10 mm. lata, carnosa, exsiccando opaca, margine leviter revoluto, nervo medio supra impresso subtus prominente, ceteris inconspicuis, supra glabra subtus praecipue in nervis longiuscule appresse sparsiuscule rubro-pilosa ; petioli 2–3 mm. longi, minute glandulosi, appresse pilosi, supra excavati. *Flores* solitarii, pedicellis 6–7 mm. longis dense appresse rubro-pilosis. *Calyx* totus vix 2 cm. longus, extra appresse rubro-pilosus, intus glaber ; tubus 1·5–2 mm. longus ; lobi anguste lineari-lanceolati, sensim attenuati, superne reflexi, circiter 1·7 cm. longi, 2·5–2·75 mm. lati, 5–6-nervii, intra superne sanguinei. *Corolla* tota fere 7 cm. longa, extra appresse pilosa, intra pilis conicis minutissime puberula, lobo antico anguste oblongo 1·7 cm. longo 5·5 mm. lato obtusiusculo 3·8 cm. supra basin inserto, lobis lateralibus triangularibus cum galea 1·2 cm. connata, margine superiore 1·1 cm. longo, galea propria oblonga (explanata) superne valde depresse triangulari-terminata 1·8 cm. longa, 1·5 cm. lata. *Filamenta* inferne 5–5·5 mm. in vaginam anticam corollae medio 3 mm. adnatam connata, partibus liberis circiter 4·5 cm. longis ; antherae vix ultra 3 mm. longae. *Glandula disci* unica, postica, cucullata, 1·75 mm. longa, 0·6 mm. bifida. *Ovarium* ovoideum, 3 mm. longum, dense albido-villosum ; stylus 6·5 cm. longus, minute glanduloso-pubescens.—*C. glabra*, Donn. Sm. Enum. Pl. Guatem. pars i. p. 32, non Oerst.

GUATEMALA. Sarax, Depart. Alta Verapaz, 1380 m., *Tuerckheim in Donnell-Smith*, 866.

508. **Columnea (Eucolumnea) oblanceolata,** *Sprague* [Gesneraceae]; species distincta foliis majusculis oblanceolatis, calyce parvo extra tantum dense villoso, lobis subpectinato-dentatis.

Ramuli exstantes circiter 13 cm. longi, obtuse tetragoni, hispidi, inferne 4 mm. diametro. *Folia* anguste oblanceolata, in basin a triente superiore sensim attenuata, apice breviter acuminata, interdum subabrupte, 6·5 11 cm. longa, 1·5–2·5 cm. lata, supra puberula vel glabrescentia, subtus strigoso-pubescentia, praesertim in nervis, exsiccando papyracea; nervi laterales utrinque 4–5, supra inconspicui, subtus satis prominentes; petioli 1–2 cm. longi, hispidi. *Flores* verisimiliter in axillis solitarii, pedicellis 2 cm. longis patule villosis. *Calyx* extra praesertim inferne dense villosus, villis aliis glanduloso-capitatis aliis eglandulosis, intra glaber; tubus 1·5–2 mm. longus; lobi anguste lanceolati, acuminati, 8–10 mm. longi, 2–3 mm. lati dentibus exclusis, subpectinato dentati, dentibus utrinque 4–5, longioribus circiter 1·25 mm. longis. *Corolla* tota 5·5–6 cm. longa, extra longiuscule glanduloso-pubescens, intra minutissime pubescens, lobo antico anguste lanceolato obtusiusculo vix 1·5 cm longo 5·5 mm. lato 3·6–3·7 cm. supra basin inserto, lobis lateralibus cum galea 1·2 cm. connatis superne triangularibus, margine superiore 7–9 mm. longo, galea propria transverse elliptica (explanata) 1–1·2 cm. longa fere 1·8 cm. lata truncato-rotundata levissime emarginata. *Filamenta* inferne 10–11 mm. in vaginam anticam corollae in medio circiter 6 mm. inferne adnatam connata, partibus liberis circiter 4·3 cm. longis dense minute patenter pilosis; antherae 3·5 mm. longae. *Glandula disci* unica, postica, 1·5–1·75 mm. longa, leviter retusa vel bifida. *Ovarium* ovoideum, 3–3·5 mm longum, dense villosum; stylus vix ultra 5 cm. longus, patule pilosus.

Costa Rica. *Hübsch.*

509. **Arthraxon Meeboldii,** *Stapf* [Gramineae-Andropogoneae]; affinis *A. lanceolato*, Hochst., sed annua, spiculis longioribus, gluma inferiore spiculae sessilis apicem versus pulcherrime argenteo-plumosa.

Gramen annuum. *Culmi* 2–3 e basi breviter prostrata ascendentes, 15–20 cm. alti, graciles, glaberrimi, simplices, 6–8-nodi, internodiis sursum accrescentibus, summo 5 7 cm. longo vix vel breviter exserto. *Foliorum* vaginae infimae a culmo solutae, caeterae arctae vel superiores plus minusve tumidae, praeter basin ad nodum barbulatam glabrae vel superne pilosae; ligulae brevissimae, hyalinae; laminae ovatae vel ovato-lanceolatae, tenuiter acuminatae, basi cordatae, amplexicaules, 2–3·5 cm. longae, 1–1·25 cm. latae, subtus (imprimis in costa) setulis basi subbulbosis obsitae, margine pilis similibus patule-ciliatae, tenuissime multinervosae. *Racemi* in apicibus culmorum bini, 3–4·5 cm. longi, unus pedunculo glabro ad 8 mm. longo suffultus; articuli anguste lineares, circiter 4 mm. longi, tota longitudine dense argenteo-ciliati ciliis sub apice 2–2·5 mm. longis, dorso praeter basin glabri; pedicelli similes, sed 3 mm. longi et fere duplo latiores. *Spiculae sessiles* anguste lineari-lanceolatae, longe acuminatae, 9·5–10 mm. longae, 1 mm. latae, callo vix ullo; gluma inferior coriaceo-chartacea, pallida, acumine purpurascente bifido dentibus angustissimis, carinis a basi ad vel ultra $\frac{3}{4}$ eleganter muricatis

muricibus summis in tuberculos abeuntibus et pilos in barbam argenteo-nitidam dispositos gerentibus, apice ipso glabro, serie tuberculorum muricibus proxima utrinque addita, nervis intracarinalibus tenuibus 3; gluma superior subnavicularis, a latere visa lanceolata, setaceo-acuminata, glumam inferiorem aequans, membranacea, 3-nervis, in carina superne asperula, ad margines tenuissime parce ciliata; valva inferior vacua, elliptico-oblonga, obtusiuscula, 4·5 mm. longa, enervis, valva superior a latere lanceolata, tenuiter acuminata, 6 mm. longa, hyalina, 1-nervis, paulo supra basin aristata, aristae columna brunnea 7–8 mm. longa, seta nitida alba 12–14 mm. longa; palea nulla. *Spiculae pedicellatae* lanceolatae, acutae, chartaceae, 7 mm. longae; gluma inferior superne bicarinata, carinis rigide ciliolatis, caeterum glabra, 9-nervis, nervis subcarinalibus utrinque 2 distinctis, caeteris tenuioribus; gluma superior lanceolata, inferiori subaequilonga, acuta, 3-nervis, ad margines tenuissime reverse ciliata; valva inferior vacua, ovato-oblonga, hyalina, subuninervis, eciliata, fere 4 mm. longa; valva superior cum flore ♂, ovata, bidentula, inter dentes mucronulata, hyalina, 1-nervis, inferiorem aequans cum palea lineari enervi 1 mm. longa. *Antherae* 2·5 mm. longae.

INDIA. Concan, in open grassland on a hillside near Khandale, 600 m., *Meebold*, 9132.

A very elegant species, easily recognised by the silvery beards of the sessile spikelets.

510. **Andropogon (Dichanthium ?) serrafalcoides**, *Cooke et Stapf* [Gramineae-Andropogoneae]; ob spiculas secundarias infimas saepissime neutras caeterum eadem forma ac fertiles si vis ad *Dichanthium* referendus, sed nulli speciei arcte affinis, spiculis maiusculis in racemos spiculis Serrafalci haud dissimiles congestis insignis.

Gramen annuum, ad 60 cm. altum, gregarium. *Culmi* graciles, laeves, glabri, e basi tenui ascendente radices fulcrantes emittente erecti, circa 10-nodi, internodiis inferioribus brevibus et ad nodos tumidis plerisque exsertis, superne ramos 1–3 solitarios longos pergraciles agentes. *Foliorum* vaginae infimae breves, laxae, mox a culmo solutae, superiores arctae, glabrae; ligulae hyalinae, ovatae, ciliatae, 1 mm. longae; laminae e basi paulo angustiore lineares, longe tenuiter attenuatae, ad 15 cm. longae, 4–6 mm. latae, flaccidae, plus minusve hirsutae, pilis e tuberculis ortis vel subglabrae, costa tenui utrinque prominente, nervis lateralibus obscuris. *Racemi* solitarii in culmorum et ramorum apicibus, oblongi, vel obovato-oblongi, 1–1·75, raro 2 cm. longi, 5–7 mm. lati, arcti vel superne subaperti, 4–6-nodi; articuli inter nodos 2 vel 3 infimos continui, breves, cylindrici, glabri, caeteri ad 1·75 mm. longi, secedentes, subclavati, latere exteriore dense sericeo-ciliati ciliis summis articulum aequantibus vel excedentibus; pedicelli infimi brevissimi, glabri, caeteri e basi angusta clavati, subflexuosi, uno latere dense sericeo-ciliati, altero in dentem lanceolatum cartilagineum producti, 2 mm. longi. *Spiculae* arcte imbricatae vel summae subdivergentes stramineae, scariosae, glaberrimae. *Spiculae sessiles* $\frac{\delta}{+}$ (nisi infima saepissime neutra); gluma inferior lanceolata in alis late alata, cum alis scariosis oblonga vel elliptico-oblonga, acuta vel breviter bifida vel apice

sublacerata, 8–9·5 mm. longa, inter carinas 7–9 nervis, marginibus angustissimis inflexis ; gluma superior, lanceolata, acuta, 6–6·5 mm. longa, 3-nervis, papyracea ; valva inferior vacua, oblonga, obtusa, hyalina, enervis vel sub 1-nervis, 3·5–4 mm. longa ; valva superior stipitiformis in aristam gracilem abiens, columna circiter 15 mm. longa arcte torta nigro-fusca nitente, seta paulo longiore pallida vel arista spiculae sessilis basalis et subbasalis imperfecta vel ad setulam minutam reducta ; palea nulla. *Spiculae pedicellatae* sessilibus similibus, sed neutrae, paulo obliquae vel tortae, alis inaequilateris, gluma superiori 5-nervi, valvis admodum reductis vel superiore suppressa. *Antherae* 1·5 mm. longae. *Caryopsis* ambitu elliptico-oblonga, a dorso compressa, 3 mm. longa. *A. Cookei*, Stapf ex Woodrow in *Journ. Bombay Nat. Hist. Soc.*, vol. xiii., p. 438 (nomen tantum).

INDIA ORIENTALIS. Western Ghats, Sakarpattar, near Lanauli. *Woodrow* !

LVIII.—MISCELLANEOUS NOTES.

Presentations to Gardens.—The collections of living plants at Kew are maintained in as complete and representative a condition as is possible by means of purchase and exchange. Plants that are likely to prove valuable in distant parts of the empire are propagated and distributed as far as the resources of the establishment will allow. Kew is largely indebted to other botanic gardens for contributions of plants and seeds, especially to the gardens at Calcutta, Ceylon, the Straits Settlements, Jamaica and Trinidad. From the Arnold Arboretum about 500 packets of seeds collected by Mr. Wilson in China and a collection of choice trees and shrubs have been received. A selection of Chinese trees and shrubs from Mr. Meyer's collection has been presented by the United States Department of Agriculture. Exchanges have been effected with the botanic gardens of Berlin, Paris, Brussels, and the Colonial garden of the Congo Free State ; also with the botanic gardens at Edinburgh, Glasnevin and Cambridge. From the Rubber exhibition held at Olympia various rubber plants were presented to Kew by exhibitors, including *Urceola* and *Parameria* from Lieut.-Col. Wyllie, Rangoon ; *Hevea guianensis* from Mr. J. G. van Hemert, Amsterdam ; *Dichopsis gutta* and *Mimusops Balata* from Dr. W. Troup de Haas, Java ; and stems of *Castilloa elastica* from the Orizaba Rubber Plantations, Ltd., Mexico. Tubers of *Raphionacme utilis*, the source of Bitinga rubber, were presented by the Companhia de Moçambique, 13 Austin Friars. Seeds of *Pouteria suavis* were purchased from Mr. E. Frosio, Paysandu, Uruguay, and from them a batch of young plants has been raised ; these will be ready for distribution next year. With the assistance of Mr. J. A. Davy, Fazienda Dumont, Sao Paulo, Brazil, a large quantity of seeds of Remanso (*M. piauhyensis*) and Jequié (*M. dichotoma*) Maniçoba rubbers was obtained and distributed to 32 botanical and agricultural stations in the tropics ; seeds were also received from Mr. D. R. O'Sullivan Beare, H.M. Consul, Bahia. Mr. T. A. Dorrien-Smith, Tresco, presented a large collection of new or rare plants which had been brought by his son, Captain A. A. Dorrien-Smith, from New Zealand ; the Hon.

Walter Rothschild, Tring, presented a collection of valuable orchids; the Rt. Hon. J. Chamberlain, Highbury, presented hybrid orchids; the Hon. Vicary Gibbs, Aldenham House, sent a set of Chinese plants, and Messrs. Philippe and Maurice de Vilmorin various trees and shrubs. Kew is also indebted to various nurserymen for valuable contributions of plants, and especially to Messrs. J. Veitch & Sons, Chelsea; Messrs. F. Sander and Sons, St Albans, and Messrs. H. Low & Co., Enfield.

W. W.

Presentations: Waterfowl.—A Mandarin Duck from the Zoological Society of London.

A pair of Mandarin Ducks presented by Col. C. G. Tottenham, Bally Curry, Ashford, Co. Wicklow, Ireland.

A pair of Common Sheldrakes presented by Mr. T. A. Dorrien-Smith, Tresco Abbey, Isles of Scilly.

A Black Swan, female, presented by H.M. Office of Works, from Regents Park.

Glastonbury Thorn. (*Crataegus monogyna* var. *praecox*).—The sacred legend which is associated with the flowering of this thorn in midwinter always gives the tree a peculiar interest to the general public. There is a specimen of it growing in the Thorn Avenue at Kew (south of the Temperate House) which does not flower regularly in midwinter. With a mild November and December such as is frequently experienced, it will flower about Old Christmas Day (January 6th), but if cold weather sets in before the New Year the flowers may not open until March or April. This year, however, they have been extraordinarily early. The tree was in full blossom in the first week of November, before any leaves had fallen. This was no doubt accounted for by the unusual warmth of the past autumn. In addition to these early blossoms, the Glastonbury Thorn at Kew always bears others at the normal flowering time of the species—May and June—and from them a crop of haws is developed. This tree was, in November, carrying flowers, fruit and full foliage simultaneously.

W. J. B.

The History of the Royal Botanic Gardens.*—To the firm of Messrs. Cassell and Company we owe the publication of an account of the Royal Botanic Gardens, Kew, the object and scope of which may best be gathered from the opening paragraphs of the introduction supplied by the late Director which are here reproduced.

"It had long been my desire to write some sort of history which would trace the beginnings and development of Kew and of all the name stands for. I believe that my predecessor in the

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* The Royal Botanic Gardens, Kew: Historical and Descriptive. By W. J. Bean, Assistant Curator. With an introduction by Sir William Thiselton-Dyer, K.C.M.G., &c.

Directorship cherished the hope that he too might accomplish the task, and I suppose that in each case the same causes defeated the intention. As with many other Government posts, the man who would control all the various activities of Kew must 'scorn delights,' even those under his immediate eye, 'and live laborious days'; he must be content, however imperfectly, to do what he can, not what he would; and must swallow, with what philosophy he may, continual discontent that the day's work cannot be crammed into the day's hours. No assistance can aid him beyond a certain point, and no one can share his responsibility.

"For some years past Mr. Olivier and Mr. Wallis—the one with the brush, the other with the camera—had devoted themselves to the illustration of Kew in its varying aspects with delightful skill. The publishers were willing to give a selection of their admirable work to the public if only the long projected book could be produced which it would serve to illustrate. The opportunity was not to be lost; it might not, and probably would not, ever recur. That the thing must be done at Kew was obvious; history may be evolved from consciousness, but it cannot be written with circumstantial accuracy without data and documents. It was a happy inspiration which led me to induce the publishers to entrust the work to the Assistant Curator. He has devoted his life to Kew, is penetrated with sympathy with its charms, and much that has enhanced them has been accomplished under his capable hand. And having read his proofs I find nothing to criticise, and can but admire the ability with which he has marshalled a vast mass of information never before brought together, and told a story with words of befitting gravity and simplicity which is to me of the deepest interest, and, I am persuaded, can be scarcely less so to its other readers.

"These few words would be sufficient to introduce those who have worthily taken part in the production of the book. But looking back upon Kew in a long retrospect, I may summarise some of the salient impressions which emerge from the mass of detail. Amongst our scientific institutions, Kew stands out with a history which is almost august. And it is characteristic of English tradition that its present constitution is the outcome of an almost inevitable evolution. Circumstance has made it, and this has given it a stability which it would not have possessed if it had been the creation of the moment, however logical.

"Outside the metropolis there is probably no spot which has seen so much history as the piece of ground included within the bend of the Thames which lies between Kew and Richmond bridges. Successive dynasties made it their residence, first in its southern and then in its northern portion. Henry VII. built the palace at Richmond, in which his successor entertained the Emperor Charles V. Queen Mary lived there, and in it Elizabeth signed the death warrant of Mary Queen of Scots, and died herself. Her court, on their way to London by Brentford Ferry, must have passed along Love Lane, which traversed the Gardens. Here was the original hamlet of Kew, which in Hanoverian times was moved eastwards round Kew Green. The etymology of the name is obscure, but the earliest form, Kay-hough, was perhaps derived from the landing-place of the ferry. Midway, at Ormonde

Lodge, George II., gave Sir Robert Walpole a rough reception when he was roused to hear of his accession to the throne, and it was in the adjoining gardens that Sir Walter Scott placed the interview of Jeannie Deans with Queen Caroline, one of the most capable of our queens. At Kew itself was the residence of the Princess Dowager of Wales and of her son, George III. Here he gave Lord Bute his dismissal, his children were brought up, and two of his sons, William IV. and the Duke of Kent, were married in the presence of the dying Queen Charlotte.

"And the impress of this history remains on Kew. The various domains which compose it have been alternately united and dissevered. But in its main features it still remains as George III. left it, though it has been perfected and refined in its details. The royal influence and atmosphere persists. It is the stately garden of a great personage, though that is now the British public and no longer the sovereign."

Holly, Yew and Box.*—The collections of Holly, Yew and Box in the Arboretum at Kew are, no doubt, more extensive than any others existing in the British Isles, and Mr. Dallimore's long experience amongst them has made him specially well-fitted to deal with the subject-matter of this work. It is an important subject for gardeners, because, in spite of all the evergreen shrubs that have been introduced from other countries, these three native evergreens remain as indispensable as ever. In a botanical sense the most important feature of this work is the segregation of the broad-leaved varieties of garden Holly under *Ilex platyphylla*. Previous monographers, including Moore, have always put these broad-leaved Hollies, such as *balearica*, *nigricans*, *Hodginsii*, &c., under *I. Aquifolium*. Mr. Dallimore's researches have led him to a different conclusion, and it seems to us with very good reason.

Whilst the book will, no doubt, be henceforth regarded as the standard work of reference on these plants, containing as it does full descriptions of all known varieties of Holly, Yew and Box, it is a good deal more than a mass of descriptive detail. The author has gathered together a most interesting series of poetical and legendary allusions, and he gives, besides, a well-written account of the economic value of these trees, their real or supposed medicinal properties, and the uses, cultivation and propagation of the plants in gardens. Of the two kinds of works of reference—the ones which say a little about many subjects, and those that profess to say all there is worth saying about a few—Mr. Dallimore's book is a conspicuously successful example of the latter. It would, indeed, be difficult to point to anything of value or interest about the Holly, Yew or Box that he has left unsaid.

The final part of the book which deals with "other evergreens" is more discursive and fragmentary, and appears to have been a sort of afterthought. Still, it contains in a condensed form much valuable information and will be useful to planters searching for

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* Holly, Yew and Box, with chapters on other Evergreens. By W. Dallimore. Bodley Head.

the best evergreens. The book is well printed on good paper, and the illustrations (mostly from photographs taken at Kew) are admirably reproduced. The varieties of common Holly are illustrated by outline drawings of single leaves which originally appeared in the "Gardeners' Chronicle."

Rhus Toxicodendron.—An article by Sir Ray Lankester in the "Daily Telegraph" of August 8th last has once more drawn public attention to the singular toxic properties of this hardy shrub. Notes and papers on the same subject have from time to time appeared in the botanical and horticultural press, but it evidently required the publicity which the columns of a great daily newspaper alone can give to awaken a general interest in it. Whilst a widespread attention has thereby been drawn to a matter on which it is very desirable the general public should be informed, the process has been accompanied by the dissemination of certain inaccuracies—which, indeed, appears to be inevitable whenever a subject of this kind is dealt with in the popular press—and much unnecessary alarm has been caused.

Rhus Toxicodendron (which is now taken to include also the *R. radicans* of Linnaeus) is widely spread over the eastern portions of North America, and is found in certain parts on the western side. It occurs also in Japan. Sometimes it takes the form of a loose, wide-spreading shrub; sometimes it is a climber. Not only is it variable in mode of growth, but also it exhibits a great diversity in the size and shape of its leaves. Although these are said to be occasionally quinquefoliate, they are almost always trifoliate. The three leaflets of a particular leaf are sometimes similar in size and shape, but usually the middle one is larger than the other two, and it has, invariably, a longer stalk. The margins are either entire or coarsely toothed, the coarse toothing being apparently more characteristic of young plants. In the autumn tints of its foliage this shrub is one of the most handsome we possess, dying off as it does into various rich shades of red. Some years ago the climbing form was distributed from a nursery as *Ampelopsis Hoggii*—a name which has, of course, no justification, but which was no doubt suggested by its similarity in leaf and colouring to *Ampelopsis Veitchii*. This is an instance in which the propensity of some plant dealers to give new names to old plants without troubling to have their identity established has been attended by a certain danger to the public, in addition to the inconvenience and confusion this practice always entails.

In the "Daily Telegraph" article a wrong description of *Ampelopsis Veitchii* was given. It was there stated that this plant has a "five-pointed leaf." This, of course, it never has. But many who read the article at once went to examine their *Ampelopsis Veitchii*, and, finding no "five-pointed" leaves there, but plenty of trifoliolate ones which fitted the description of *Rhus Toxicodendron*, they were immediately struck with the fear that they were entertaining unawares the dreadful poison-ivy. As a matter of fact *Rhus Toxicodendron* is a rather uncommon plant out of large gardens. Over 140 letters and specimens were received in

a few days at Kew in connection with this question, but in only five cases was the true poison-ivy sent.

The poisonous effects of *Rhus Toxicodendron* on the skin have long been known. As long ago as 1623 the author of the "Historye of the Bermudaes" alluded to them, and there is now quite an extensive although scattered literature on the subject. Although its effects do not appear to be so violent in this country as in North America, numerous instances of Rhus poisoning are known to us here. The juice produces blisters and eczema-like eruptions on the skin, often accompanied by a general feeling of uneasiness and depression, in addition to the itching, pain and inflammation of the parts particularly affected. The supposed active principle, named "toxicodendrol" by Dr. F. Pfaff of Harvard, is insoluble in water. It is, therefore, of no use to attempt to remove the juice from the skin by washing with water. It saponifies and is rendered inert in conjunction with alkalies, and readily dissolves in alcohol. The best remedy to apply to the skin is an alcoholic solution of sugar of lead (lead acetate) which is said to give immediate and permanent relief. (*See* article by V. K. Chesnut in *Yearbook of the U.S. Department of Agriculture* for 1896, p. 139).

Among the recent correspondents of Kew was a lady who sent the true *Rhus Toxicodendron* with the remark that she had used the leaves for dinner-table decoration. As no evil consequences were recorded she was evidently one of the persons who are immune from the effects of this poison. This correspondent also drew attention to an interesting property of the juice of this plant, namely, its indelibility when applied to linen and similar fabrics. She found that wherever the liquid touched the white table-cloth it produced a perfectly ineradicable stain, and remarks that "it is really better for marking purposes than many so-called indelible marking inks." This property has long been known to botanists. Kalm noticed it during his travels in North America about the middle of the 18th century. And in Woodville's "Medical Botany" (1832) it is stated that "this juice, applied to linen, forms one of the most perfect kinds of indelible ink; it does not fade from age, washing, or exposure to common chemical agents . . . . . but continues to grow darker as long as the linen lasts." It may be mentioned that the juice (which immediately exudes from a broken or cut surface of the wood or leaf-stalks) is at first milky and yellowish, but soon becomes black.

W. J. B

Presentations to Museums.—Forestry Exhibits.—His Grace the Duke of Wellington, K.G., Stratfieldsaye, Mortimer, Berks. Specimens of hazel damaged by rabbits, and pine cones nibbled by squirrels.

The Most Honourable the Marquess of Bath, Longleat, Warminster. Specimens of various timbers damaged by honeysuckle and a specimen of holly encircled by ivy.

The Right Honourable the Earl Beauchamp, Madresfield, Malvern. Specimens of larch timber grown under various conditions,

section of a tree of *Pinus sylvestris* killed by rifle bullets, photographs of hoop making, charcoal burning and coppice beech from stools, &c.

Sir C. T. Dyke Acland, Bart., Holnicote, Taunton. Twenty-nine planks of various timbers, including Lucombe oak, wild cherry, Wych elm, alder, lime, holly, &c.

Lady E. F. Smyth, Ashton Court Estate. Series of specimens showing damage done by squirrels and rabbits to fir, sycamore, ash, larch, &c. Specimens of ash with holes bored by woodpecker, and other material to illustrate injury caused by the entwining of honeysuckle, also young plants of beech and larch injured by ants.

The Director of Forestry, Manila. A collection of 106 sections of Philippine woods.

H.E. the Hungarian Minister of Agriculture, from the Hungarian Exhibition, Earl's Court, per Mr. Földi. A large and varied collection of timber specimens and forestry products; per Mr. Krolopp, 37 specimens in fluid of vine diseases prepared by the Royal Hungarian Ampological Institute, and 13 photographs of parks in Hungary.

International Rubber Exhibition, Olympia. From the Ceylon Association, London. Stems of Para rubber (*Hevea brasiliensis*) to illustrate the different methods of tapping, stem of *Manihot Glaziovii* the Ceara rubber tree, 17 samples of Para rubber, oil from Para rubber seed, and latex from the Jack tree (*Artocarpus integrifolia*). Exhibited in the Ceylon section.

Mr. H. N. Ridley, F.R.S., Director, Botanic Gardens, Singapore. Stem, various samples of rubber and two herbarium specimens of *Hevea brasiliensis*, from the Malay section, Olympia.

Mr. E. Maurer, New York. Plant of Guayule (*Parthenium argentatum*) and samples of raw and manufactured Guayule rubber. Olympia.

Mr. J. G. van Hemert, Amsterdam. Portion of tapped stem of Balata (*Mimusops Balata*) and samples of crude and purified balata from Surinam. Olympia.

Orizaba Rubber Plantations, Ltd. Stems of *Castilloa elastica*. Olympia.

Mr. G. A. Witt. Ordinary block and laminated Rambong rubber (*Ficus elastica*), Sumatra. Olympia.

Mabira Forest (Uganda) Rubber Co., Ltd. Samples of Crepe rubber from *Funtumia elastica*, and photographs of the rubber industry. Olympia.

Franco-British Exhibition. From the Indo-China section, per M. C. le Jeune, a large and varied selection of raw vegetable products, including resins, oil-seeds, dyes, tans, fibres, &c.

From the Tunis section, per M. T. Simonot. A collection of varied products, including cereals, cork, fibres, olives and olive oil.

From the French West African section, per M. Max Robert. A large and miscellaneous collection of vegetable products, including gums, resins, cotton, rubber, ground-nuts and implements used in the cultivation, oil palm products, &c.

M. Raynaud, Biarritz. Map, with illustrations, of the Truffle districts and industry in France, per Senator Dr. Albert Viger. French Agricultural section.

Mr. M. Ulcoq. Portfolio of dried plants and three planks of timber from the Mauritius section.

The following presentations have also been recently made to the Museums :—

Mr. A. M. Burn Murdoch, Conservator of Forests, Federated Malay States. Wood of *Balanocarpus maximus*, with Damar adhering to the bark, and two photographs of Damar trees.

Mr. R. Derry, Assistant Superintendent, Botanic Gardens, Singapore. Sample of Gutta Jelutong from *Dyera costulata*.

Mr. Francis Fox, C.E. Section of beech wood from the foundations of Winchester Cathedral.

Mr. F. Beresford Wright, Wootton Court, Warwick. A piece of oak wood from the oak and cement foundations of the Roman bridge (discovered in 1792) over the River Trent, East Bridgeford, built about A.D. 120.

Mr. F. H. Hunicke, New York. Rubber specimens to show the method of preparation of rubber from *Landolphia Thollonii*, from Black River, Congo Free State.

Messrs. Thomas Turner & Co., Cassiobury Mills, Watford. Specimens illustrating the manufacture of dumb-bells of elm and beech, Indian clubs of elm, felloe of ash, spoke of ash, &c.

Messrs. Walter Rogers, Sons, & Barnes, Watford, Herts. Specimens to illustrate the manufacture of rake handles and scythe sneaths of birch and various tool handles of ash.

Messrs. Thos. Wright & Son, Waterside, Chesham. Various articles made of home-grown timbers, including spades, hoops and articles for domestic use.

Assistant-Director, Royal Gardens, Kew. Samples of maize from the vicinity of La Paz, Bolivia, 11–13,000 ft., and samples of Quinoa (*Chenopodium Quinoa*), a farinaceous seed used as food. From the shores of Lake Titicaca, 12–13,000 ft. Bolivia.

J. M. H.

Landolphia Thollonii, *Deuèvre.*—Mr. Felix H. Hunicke, of the Continental Rubber Company of America, whose name is known in connection with the Guayule rubber industry of Mexico, has recently visited the neighbourhood of the Black River, Stanley Pool District, Congo Free State, and has kindly presented to the Royal Botanic Gardens, Kew, a series of samples illustrating the process which he has evolved for obtaining a good sample of rubber from the bark of the roots of *Landolphia Thollonii*. The roots are cut up into sections from which the bark is removed, and the woody portions are then discarded. The separated bark is then placed in the "Hunicke" machine and ground to powder, with the result that the finely-granulated bark falls out and the rubber is left behind. This rubber appears to be practically free from the

impurities of pieces of bark which are always to be found in considerable quantity in the rubber as extracted by the natives. The rubber may be sheeted or exported direct in the somewhat granular form in which it is turned out by the process. The rubber is of very good quality, and the yield from the roots is said to be about 10 per cent. As the process is of a simple character, and there is an abundance of water power, the new process seems likely to make a considerable advance in the value of the *Landolphia* root rubber.

The value of the *Landolphia*, however, does not end with the rubber, for from the granulated bark a fine, rich, red-brown dye is obtained. Mr. Hunicke has presented samples both of the granulated bark and of the dye, and also specimens of the impure rubber as extracted by the natives, and a herbarium specimen of the leaves and flowers of *Landolphia Thollonii*.

A sample of the root of *Landolphia humilis*, K. Schum., with a herbarium specimen also accompanies these specimens. The rubber from this plant is small in quantity and of very little value.

A sample of the root and a herbarium specimen of *Carpodinus lanceolata*, K. Schum., from the Black River, Congo, are also included.

Sideroxylon novo-zelandicum, *Hemsl.* (syn. *Achras novo-zelandica*, F. Muell.).—As long ago as 1875, the late Sir Ferdinand von Mueller pointed out (*Fragm. Phytogr. Austral.* vol. ix. p. 72) that the New Zealand plant, generally referred to the Norfolk Island *Achras costata*, Endl. (*Prodr. Fl. Norf.* 1833, p. 49; *Iconogr. Gen.* Pl. t. 83), did not agree with Bauer's drawings. Comparing the Norfolk Island specimens with those from New Zealand, I think Mueller was right. The leaves of the Norfolk Island plant are on the whole larger, thicker, more tapering towards the base, and the petioles are longer. The flowers are usually in pairs in typical *A. costata*, and solitary in the New Zealand specimens we have seen. Kew, however, possesses no well-developed flowers from Norfolk Island, but the calyx in the fruiting specimens is much larger than in *S. novo-zelandicum*.

W. B. H.

Asiatic Lardizabalaceae.—*Hooker's Icones Plantarum*, vol. xxix. (December, 1907) tt. 2842–2849, contains figures and descriptions of a number of Asiatic, mainly Chinese, members of this family, including a new genus, *Sinofranchetia*, Hemsl.; and in the letterpress to t. 2843 *Holboellia*, Wall. (1824) and *Parvatia*, Decne. (1837) are reduced to *Stauntonia*, DC. The reasons for this course are not so fully discussed as they might be; but I did not judge that it was necessary to enter into details, because I was merely following what had been done long ago by Wallich and Griffith. However, one of the principal reasons given is the presumed insufficiency of the presence or absence of petals (nectaries) as a generic character, and unfortunately the explanation was so phrased as to convey the impression that it was

inconstant in the same species. This was not intended; but Mr. F. Gagnepain, in a "Revision des Lardizabaleés Asiatiques de l'Herbier du Muséum," in the *Bulletin du Muséum d'Histoire Naturelle*, 1908, pp. 64–70, has understood it in that sense, and says: "M. Hemsley a fait trop bon marché d'un caractère que j'ai reconnu parfaitement fixe et invariable après la plus part des botanistes descripteurs." On this ground he restores *Holboellia* and *Parvatia* to generic rank. Confining myself to the genera in question, his main distinctions are :—

A. Petals nectariferous, 6, at least in the male flowers.
  1. Stamens free ... ... *Holboellia.*
  2. Stamens united by the filaments ... *Parvatia.*

B. Petals none, even in the male flowers.
  1. Stamens united by the filaments ... *Stauntonia.*

From this classification it may be seen that petals (nectaries) may be present with either free or monadelphous stamens, and free or united stamens constitute the only difference between *Parvatia* and *Holboellia*. As quoted above, Gagnepain says of *Stauntonia*: "petals (nectaries) none, even in the male flowers," without reference to any supernumerary organs of any kind in the female flowers; but in *Stauntonia chinensis*, DC. (*Hook. Ic. Pl.* t. 2846) there are six small, scale-like, fleshy organs in the female flowers. The organs present have the appearance of nectaries rather than that of staminodes, but their true nature can only be determined from fresh material, or by anatomical examination. The female flowers of *S. obovata*, Hemsl., contain similar, though smaller organs, about 0·5 mm. long. Given the presence of nectaries in the female flowers of *Stauntonia* (in the restricted sense), their absence from the male flowers of the same species is practically the only point of difference from *Parvatia*, Decne.

Admitting, as I do, that any one of these characters, or combination of two of these characters, is constant in the same species, they are hardly generic distinctions, especially as they do not correlate with other floral or vegetative characters. Mr. Gagnepain lays great stress on the fact that he has found no instance of the absence of nectaries where the stamens are free (*Holboellia*), or their presence where the stamens are united (*Stauntonia*), and also on the fact that the figures in the *Icones Plantarum* bear out this statement. That is true, if we ignore *Parvatia*, as he does in this discussion. However, apart from the characters in question, there are others deserving of consideration in the limitation of genera. Gagnepain has nothing to say about staminodes, except that in his description of what he takes to be the female flowers of *Stauntonia parviflora*, Hemsl., he has: "Staminodia parvula, 6." Now, the question arises whether they are really staminodes or nectaries; a question difficult to answer, because undoubted staminodes—imperfect stamens—sometimes bear glands or nectaries. But in some species of *Stauntonia* (in the broad sense) there are both staminodes and nectaries present in the female flowers as separate organs. This is the case in *S. hexaphylla*, Decne. and in *S. longipes*, Hemsl. (*Hook. Ic. Pl.* t. 2848), but, as already stated, I have not found any nectaries (petals) in the male flowers of the former; yet they are present in the male

flowers of the latter, though very small. In *Parvatia*, as described and figured by Decaisne, the nectaries (petals) are relatively large in the male flowers, and the nectaries and staminodes are very small in the female flowers. These three examples represent the three proposed genera : *Stauntonia*, *Holboellia*, and *Parvatia*, the female flowers of which are in other respects exactly of the same structure, differing only in the size and shape of the parts. This reduces the distinctions to the slight modifications indicated in the male flowers, which amount to :—

Presence of nectaries associated with free stamens	*Holboellia.*
Presence of nectaries associated with united stamens	*Parvatia.*
Absence of nectaries [from male flowers]; stamens united	*Stauntonia.*

Mr. Gagnepain does not attempt to show that there are other differences, and, it may be added, there are none in the vegetative characters. Therefore I believe it will be generally conceded that there is no justification for restoring *Holboellia* and *Parvatia* to generic rank. Combined with *Stauntonia* they together constitute a genus as distinct as *Deraisnea*, *Akebia*, or *Sinofranchetia*.

Coming to species Mr. Gagnepain's views are again opposed to mine, but here it is aggregation instead of segregation. For example, under *Holboellia latifolia*, Wall., he places *H. angustifolia*, Wall., and *Stauntonia longipes*, Hemsl., together with other forms, as varieties. They are certainly closely allied, but I am still of the opinion that it is better to call them species and give them one name instead of two.

W. B. H.

Hooker's Icones Plantarum.—Part 3 of Volume XXIX. of this work appeared in September. It is wholly devoted to the illustration of new Chinese and Indo-Chinese species of *Impatiens*, described by Sir Joseph D. Hooker, who has spent the greater part of the last five or six years studying this difficult genus. The species described and figured exhibit a great variety in floral structure. The author employs the term labellum for the spurred sepal ; standard for the odd petal, and wings for the two 2-lobed lateral petaloid organs, usually considered as consisting of two connate petals. Most of the species figured have relatively small flowers. *I. attopeuensis* belongs to a group characterised by the lobes of the wings terminating in a thread-like continuation, and a strongly keeled, 2-lobed standard. *I. Lanessani* is one of a set in which the distal lobes of the two wings are connate, and the spur of the lip very short, curved upwards and slightly notched. *I. verrucifer* is remarkable in having two large glands at the base of the blade of the leaf. In *I. zygosepala* the sepals are large and connate, enclosing the very short, broad labellum. *I. Abbatis* has four well-developed sepals ; a lip with a very broad spur and scarcely any limb ; a very small standard, and very oblique wings. *I. Balansae* and *I. claviger* are relatively large-flowered species of similar structure. *I. Leveillei* is distinguished by the very small

standards being furnished with a dorsal curved horn. *I. atherosepala* has armed sepals. In short, each species exhibits some interesting character. Many, indeed most of these species were described and figured from very fragmentary material, but Miss Smith has been quite successful in building them up.

W. B. H.

Botanical Magazine for October.—The handsome Globe Thistle, *Echinops Tournefortii*, Ledeb., figured on plate 8,217, is a native of Armenia and Persia, and was first described from plants raised in the Dorpat Botanic Gardens from seeds collected on Mount Ararat. Its globose heads of white flowers are sometimes as much as five inches in diameter. The plant figured originally came from the garden of Canon Ellacombe at Bitton, Gloucestershire. *Rosa sericea*, Lindl., var. *pteracantha*, Franch., a white-flowered species with elegant foliage, is remarkable for the large compressed decurrent red prickles which clothe its branches. It is a native of Western China and Manipur, and was first introduced into European gardens by Mr. Maurice L. de Vilmorin. The Kew plant from which the drawing was prepared was purchased from Messrs. Paul of Cheshunt, in 1906. *Anisotes diversifolius* is a representative of a small genus of Acanthaceae allied to *Justicia*, natives of Arabia, Tropical Africa and Socotra, the last named being the home of the species now figured from a specimen presented to the gardens by Colonel Beddome. Its flowers are two-lipped, flame-coloured or yellow, 1½–2 in. long. *Lewisia Cotyledon* is an acaulescent perennial, with rosulate fleshy leaves and flowers about an inch and a quarter in diameter, white, densely lined with red. It is an attractive plant resembling in its flowers certain species of *Oxalis*. The specimen figured came from the Siskiyou Mountains, Oregon, and was presented by Mr. P. B. Randulph, of Seattle, Washington, in 1906. The last plate is given to an interesting Asclepiad, *Raphionacme utilis*, Brown & Stapf, the tubers of which yield a large quantity of rubber reputed to be of good quality. It is a native of the interior of Angola, and has been identified with the "Ecanda" or "Marianga" Rubber-plant. Some tubers were presented to Kew in 1907 by the Companhia de Moçambique, and in the *Kew Bulletin*, 1908, pp. 209–215, where the plant is originally described, particulars relating to its field culture are supplied.

Botanical Magazine for November.—The plants figured are: *Mussaenda erythrophylla*, Schum. et Thonn., *Meconopsis sinuata*, Prain, var. *latifolia*, Prain, *Berberis yunnanensis*, Franch., *Columnea magnifica*, Klotzsch et Hanst., and *Pyrus sinensis*, Lindl. The *Mussaenda*, a Tropical African species, has been sent to Kew by Mr. H. N. Ridley, Director of the Singapore Botanic Gardens. It was first introduced into cultivation by Mr. Gustav Mann in 1863, and a second time in 1886, by Mr. W. Micholitz, collector for Messrs. Sander & Sons, but it does not appear to have become established, and probably soon disappeared from gardens. In this striking plant one of the calyx-lobes in some of the

flowers is as much as five inches long and four inches broad, and of a brilliant crimson colour. The pretty *Meconopsis*, with large light-blue flowers, was raised at Kew from seeds sent from Kashmir, in 1906, by Lieut.-Col. Appleton. It differs from the type, which is not in cultivation, by having broader leaves and a shorter capsule. *Berberis yunnanensis* is one of Mr. Maurice L. de Vilmorin's introductions from China, and Kew is indebted to him for the plant from which the drawing was made. Its lemon-yellow flowers and red ellipsoid berries are larger than is usual in the cultivated species. *Columnea magnifica* is a Central American species which was brought into cultivation by Messrs. V. Lemoine & Sons, of Nancy, about four years ago. The figure was prepared from specimens presented by Col. Beddome and Mr. W. E. Gumbleton. *Pyrus sinensis* is a native of Manchuria and Korea, and for a considerable time has been cultivated in Northern China and Japan. It was introduced into this country in 1820, and has been grown at Kew since 1875, when the late Prof. Decaisne presented to the establishment a collection of grafts of *Pyrus*, including some of *P. sinensis*. Its white flowers are produced freely at Kew, but fruits, which are very astringent, do not ripen very freely.

Botanical Magazine for December.—*Eupatorium Raffillii*, Hemsl. (t. 8227), supposed to be a native of Central America, was procured by Mr. C. P. Raffill of the Tropical Department, Kew, from the Birmingham Botanic Garden, where it has been grown for many years under the name of *E.* (*Hebeclinium*) *ianthinum* from which it may be distinguished by the arachnoid-tomentose inflorescence, the larger subumbellate capitula, and the fewer bracts of the involucre. *Corytholoma macropodum*, Sprague (t. 8228), is a South Brazilian Gesneraceous plant, with sub-umbellate cinnabar-red flowers, for which Kew is indebted to Mr. G. H. Weigt, Director, Botanical Parks, Piracicaba, Brazil, who communicated seeds in 1906. The stems, which arise from a subglobose tuber, bear only one or two pairs of shortly stalked suborbicular leaves. *Eria hyacinthoides*, Lindl. (t. 8229), is a pretty Javan species, which produces in May several spikes of white flowers. The plant figured was presented to Kew by Mr. F. W. Moore, of the Royal Botanic Gardens, Glasnevin, in 1903. *Cytisus decumbens*, Spach (t. 8230), is a small trailing shrub with bright yellow flowers, a native of South Europe, where it is widely distributed. The Kew plants originated from seeds received from the Goettingen Botanic Garden in 1895. *Hibiscus aponeurus*, Sprague & Hutchinson (t. 8231), was recently described for the first time in the *Kew Bulletin* from dried specimens sent to Kew by several collectors in Tropical East Africa. It has now been introduced into cultivation by Lady Hindlip, who collected seeds in British East Africa and who, in 1905, presented cuttings to Kew. The volume of the Magazine completed with this issue is dedicated to Sir Joseph Dalton Hooker, O.M., G.C.S.I., C.B., who for the remarkably long period of forty years was its editor, and to whom the publication so largely owes the high position it holds amongst the botanical and horticultural literature of the world.

Richard Spruce.—The Botanical manuscripts of the late Richard Spruce have recently been presented to the Library through the kindness of DR. ALFRED RUSSEL WALLACE. In offering the volumes to Kew, Dr. Wallace wrote to the Director on November 11th, 1908, from Broadstone, Wimborne, as follows.—"I am empowered by Dr. Spruce's executor, Mr. M. B. Slater, to offer to the Kew Botanical Library the following MSS. Journals and notes of Spruce, together with the letters received by him from various botanists as enumerated in the List enclosed.

"To them I add the letters to Mr. W. Borrer which have come into my hands as executor of the late Mr. W. T. Mitten.

"Please inform me if these or any of them will be acceptable and I will at once forward them."

The following is the list of Spruce's Botanical Manuscripts enclosed by Dr. Wallace.

"Plantae Amazonicae. 2 vols. bound.

"Plantae Andinae. 2 vols. bound. Containing numerical Register (up to 6580) to his flowering plants and ferns. Often with detailed descriptions.

"MSS. Vol. I. (bound). Containing a large number of notes and short articles, on various scientific subjects, but very largely botanical.

"MSS. Vol. II. (bound). Containing the whole of his original 'Journal' from July 1851 to July 1855. (Last 4 months at Manaos to his arrival at Tarapoto, Peru.) This is full of botanical notes and observations, only very partially gleaned by me; and occupies more than half the volume. The remainder is botanical notes and register of Mosses.

"Very thick Memorandum book containing original 'Journal' from Tarapoto to Banos, with much botanical matter (only skimmed by me). Also copious notes on his Mosses and Hepaticae.

"Besides the seven volumes enumerated, there are the letters received by him (mostly when in South America) from Sir William Hooker, Mr. G. Bentham, Sir Joseph Hooker, Mr. Wm. Mitten, Mr. Miers, Mr. Destringe and M. Emile Bescherelle.

"Rough Notes for the Introduction to his large work on the Hepaticae (never written in English) and a few on other botanical subjects.

"The complete series of letters from R. Spruce to Mr. William Borrer, of Henfield (1843–1848), almost wholly on the critical study of British and European Mosses and Hepaticae."

A copy of "Notes of a Botanist on the Amazon & Andes," by Richard Spruce, largely founded on the above manuscripts, and edited by Alfred Russel Wallace, O.M., F.R.S, has been presented to the Library by the Editor.

New Zealand.—Two reports to the Department of Lands, New Zealand, have been presented to the Royal Botanic Gardens by the author, Dr. L. Cockayne.

One is a Report on a Botanical Survey of the Tongariro National Park, which was created by Act of Parliament in 1894, and the other deals with the Waipoua Kauri Forest reserve. Both reports are of a comprehensive and interesting character and contain a mass of admirably treated botanical information. The photographs with which they are illustrated considerably enhance their value and are deserving of high praise.

These reports together with the previous report on Kapiti Island (*K.B.*, 1908, p. 266) form a fitting tribute to the wisdom of the Minister of Lands, New Zealand, in directing that these surveys should be undertaken and in having placed the work in the hands of Dr. Cockayne.

Trinidad Herbarium List.—A List of the specimens mounted and classified in the herbarium of the Botanical Department, Trinidad, has been compiled by Mr. J. H. Hart, lately Superintendent. From a collection of 3,000 specimens in 1887 the number has increased to about 30,000 in 1908, and besides Trinidad plants includes specimens from Bolivia, Porto Rico, Grenada, &c. It appears that a large number of additions have yet to be arranged and classified, but as it stands the list shows a good representative collection of the flora of Trinidad.

Southern Islands Expedition.—A letter has been addressed to the Editor of the *Kew Bulletin* by the Philosophical Institute of Canterbury, New Zealand, on the subject of the article by Capt. Dorrien Smith in *Kew Bulletin*, No. 6. This letter has been forwarded to Capt. Dorrien-Smith and he has requested us to insert his apologies to the Philosophical Institute in the *Bulletin*.

With regard to the photographs it must be stated, in fairness to Capt. Dorrien-Smith, that the words "taken by" at the end of the Explanation of Plates were inserted without his knowledge, but in the belief that the photographs selected were, as was the case with the majority of the large collection submitted, his own work.

The Editor, The KEW BULLETIN.

DEAR SIR,

As some explanation seems to be necessary, with regard to an article appearing under your issue No. 6, to the Philosophical Institute of Canterbury, I shall be very much obliged if you will insert in your columns my deepest apologies for what under the circumstance would appear a breach of faith on the part of myself, who was a much honoured member of the Southern Islands Expedition organised by them in November last. The author wishes to assure the Council that he had no intention or inclination whatever of infringing their rights when he gave his sanction to the publication of what was originally a private article, and he was quite unaware that the photographs appearing in the article

were the property of the Council. Such an entire misunderstanding on his part, that nothing was to be published either in England or New Zealand regarding the expedition without the Council's sanction, is deeply regretted.

I am, etc.,

A. A. Dorrien-Smith,
Captain.

Coagulation of Latex.—In *Der Tropenpflanzer* for November, 1908 (12 Jahrg., Nr. 11, pp. 520–4), D. Sandmann gives an account of a new method of obtaining caoutchouc from latex.

The separation of the caoutchouc is carried out in the following way. Freshly tapped latex, with or without admixture of water, is strained, poured into dishes, and well mixed with a small amount of a liquid preparation of certain acid fluorine compounds, which bring about slow coagulation, and at the same time destroy all putrefactive germs. The mixture is allowed to stand for some hours, and the rubber, having by this time collected at the surface, can be removed from the dishes, after which it only requires to be freed from water by pressure, and is then ready for transport.

The fluorine-preparation is sold under the name of "Purub," and its use is protected by patents.

It is claimed that this method has much to recommend it, since it is very simple, and has been found to yield rubber of decidedly good quality, equal in value to the best kinds of Para rubber. Hitherto this method has been chiefly applied to the extraction of rubber from the latex of *Hevea*, but, no doubt, similar experiments will shortly be made with the latex of other plants.

List of Botanical Staffs (Appendix IV.) : Errata and Addenda.—

Page 111, line 8 from top, *for* *T. W. Main *read* *J. W. Campbell ; line 10 from top *for* *J. W. Campbell *read* *F. R. Long.

Page 104, under **Dublin** add—

Trinity College Herbarium :—

Keeper - - - - E. P. Wright, M.D., F.L.S.

Page 106, under **Gold Coast** add—

Director of Agriculture - W. S. D. Tudhope.

Page 110, under **Singapore** add—

Assistant Superintendent *T. W. Main.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1908.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1907. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of February.

HERBACEOUS PLANTS.

Acaena macrostemon.
microphylla.
Novae-Zelandiae.

Achillea Ageratum.
alpina.
macrophylla.
rupestris.
serbica.

Achyrachaena mollis.

Aconitum orientale.
uncinatum.
vulparia.
Wilsoni.

Actaea spicata.
— var. rubra.

Actinomeris squarrosa.

Adesmia muricata.

Adonis aestivalis.

Aethionema cappadocicum.
cordatum.
grandiflorum.
pulchellum.
saxatile.

Agrimonia odorata.
repens.

Agropyron acutum.
junceum.
tenerum.

Agrostis alba.
capillaris.
elegans.
nebulosa.

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Ajuga Chamaepitys.

Allium acuminatum.
albo-pilosum.
atropurpureum.
cardiostemon.
giganteum.
karataviense.
margaritaceum.
narcissiflorum.
odorum.
pulchellum.
Schuberti.
subvillosum.
Suworowi.
zebdanense.

Alonsoa linearis.
Warscewiczii.

Alstroemeria aurantiaca.
haemantha.

Althaea armeniaca.
ficifolia.
kurdica.
pontica.
rosea.
sulphurea.
taurinensis.

Alyssum argenteum.
creticum.
gemonense.
incanum.
podolicum.
rostratum.

Amaranthus caudatus.
Dussii.
polygamus.
retroflexus.
speciosus.

Ambrosia artemisiaefolia.

Amellus annuus.

Amethystea caerulea.

Ammobium alatum.

Ammophila arundinacea.

Amphoricarpus Neumayeri.

Amsinckia angustifolia.

Anacyclus officinarum.

Anaphalis cinnamomea.

Anarrhinum bellidifolium.

Anchusa capensis.
hybrida.
italica.

Androsace lactea.

Anemone apennina.
baldensis.
blanda.
decapetala.
multifida.
parviflora.
pratensis.
Pulsatilla.
— var. lilacina.
rivularis.
sylvestris.
virginiana.

Angelica dahurica.

Anoda hastata.
Wrightii.

Anthericum Liliago.
ramosum.

Anthoxanthum Puelii.

Antirrhinum Asarina.
Orontium.

Apera interrupta.
Spica-Venti.

Aplopappus croceus.

Aquilegia alpina.
canadensis.
chrysantha.
flabellata.
glandulosa.
Kitaibeli.

Arabis alpina.
arenosa.
cenisia.
pumila.

Aralia racemosa.

Arctium intermedium.
majus.
nemorosum.

Arenaria aretioides.
cephalotes.
graminifolia.
grandiflora.
gypsophiloides.
liniflora.
pinifolia.

Argemone hispida.
platyceras.
stenopetala.

Aristida adscensionis.

Armeria canescens.
juncea.
majellensis.
plantaginea.

Arnica Chamissonis.
longifolia.
montana.
Parryi.
sachalinensis.

Arthraxon ciliaris.

Asperella Hystrix.

Asperula azurea.
ciliata.
galioides.

Asphodeline liburnica.

Asphodelus albus.

Aster alpinus.
var. himalaicus.
canescens.
foliaceus.
radula.

Astilbe chinensis.

Astragalus alopecuroides.
boeticus.
chinensis.
danicus.
Echinus.
frigidus.
pentaglottis.

Astrantia Biebersteinii.
neglecta.

Athamanta Matthioli.

Atriplex littoralis.
rosea.
sibirica.

Atropa Belladonna.

Aubrietia gracilis.
Pinardi.

Baeria coronaria.

Baptisia australis.
leucantha.

Barbarea arcuata.

Basella rubra.

Beckmannia erucaeformis.

Bellium minutum.

Beta trigyna.

Bidens frondosa.
grandiflora.
leucantha.

Biserrula Pelecinus.

Biscutella auriculata.
ciliata.
laevigata.

Blumenbachia insignis.
muralis.

Bocconia cordata.
microcarpa.

Borago laxiflora.

Brachycome iberidifolia.

Brachypodium distachyum.
pinnatum.
sylvaticum.

Brassica alba.
campestris.
— var. chinensis
Cheiranthos.
Erucastrum.
juncea.

Briza geniculata.
maxima.
minor.

Brodiaea laxa.

Bromus adoënsis.
albidus.
breviaristatus.
carinatus.
ciliatus.
macrostachys.
marginatus.
maximus.
Porteri.
pumpelianus.
Richardsoni.
rubens.
secalinus.
squarrosus.
Tacna.
Trinii.
unioloides.

Bulbinella Hookeri.

Bunias orientalis.

Buphthalmum salicifolium.

Bupleurum aristatum.
Candollei.
glaucum.

Caccinia strigosa.

Calamagrostis confinis.
epigeios.
varia.

Calamintha grandiflora.
patavina.

Calandrinia grandiflora.
Menziesii.

Calceolaria mexicana.
polyrrhiza.

Callirhoë pedata.

Callistephus hortensis.

Caltha polypetala.

Calystegia sylvatica var. rosea.
sepium var. dahurica.

Camassia Cusickii.
esculenta.
Fraseri.
Leichtlinii.
montana.

Camelina sativa.

Campanula alliariaefolia.
barbata.
bononiensis.
lactiflora.
latiloba.
latifolia.
longistyla.
michauxioides.
phyctidocalyx.
primulaefolia.
punctata.
Steveni.
thyrsoides.

Capsella Heegeri.

Carbenia benedicta.

Cardamine chenopodifolia.
digitata.

Carduus cernuus.
niveus.
tenuiflorus.

Carex arctata.
Buchanani.
depauperata.
paniculata.
pendula.

Carlina acaulis.

Carthamus leucocaulos.

Carum buriacticum.

Catananche lutea.

Cedronella cana.
triphylla.

Celsia Arcturus.

Cenchrus tribuloides.

Cenia turbinata.

Centaurea atropurpurea.
cynaroides.
dealbata.
pulchra.
rupestris.
ruthenica.

Centranthus macrosiphon.
Sibthorpii.

Cephalaria alpina.
tatarica.
transylvanica.

Cerastium Biebersteinii.
tomentosum.

Cerinthe aspera.
major.
retorta.

Chaenostoma foetidum.

Chaerophyllum aromaticum.
aureum.
nodosum.

Charieis heterophylla.

Chelidonium Franchetianum.

Chelone Lyoni.
obliqua.

Chenopodium ambrosoides.
Bonus-Henricus.
urbicum.
virgatum.

Chloris barbata.
elegans.

Chlorogalum pomeridianum.

Chorispora tenella.

Chrysanthemum cinerariae-
folium.
corymbosum.
setabense.
viscosum.

Chrysopogon Gryllus.

Cicer arietinum.

Cimicifuga cordifolia.
racemosa.

Cladium Mariscus.

Clarkia elegans.
pulchella.

Claytonia asarifolia.

Clematis diversifolia.
integrifolia.

Cleonia lusitanica.

Clintonia umbellata.

Clypeola Jouthlaspi.

Cnicus arachnoideus.
canus.
eriophorus.
oleraceus.
syriacus.

Cochlearia officinalis.

Codonopsis ovata.
rotundifolia.

Coix Lacryma-Jobi.

Collinsia bicolor.
verna.

Collomia gilioides.
grandiflora.
linearis.

Commelina coelestis.

Conringia orientalis.

Convolvulus farinosus.
siculus.
tricolor.
undulatus.

Coreopsis auriculata.
coronata.
Drummondi.
grandiflora.
tinctoria.

Coriandrum sativum.

Cornucopiae cucullatum.

Coronilla elegans.

Corydalis cheilanthifolia.
glauca.
racemosa.
rosea.
thalictrifolia.

Cosmos diversifolius.

Crambe hispanica.

Crepis blattarioides.
grandiflora.
rubra.
sibirica.

Crocus asturicus.
aureus.
biflorus var. Weldeni.
— var. Pestallozae.
cancellatus.
— var. mazziaricus.
candidus.
chrysanthus.
Clusii.
Fleischeri.
hadriaticus.
— var. chrysobelonicus.
iridiflorus.
Korolkowi.
laevigatus.
medius.
Olivieri.
pulchellus.
Salzmanni.
Tourneforti.
zonatus.

Cucubalus baccifer.

Cuminum Cyminum.

Cuphea Llavea.
Zimapani.

Cuscuta glomerata.

Cyclamen Coum.
ibericum.
repandum.

Cynoglossum microglochin.
pictum.
Wallichii.

Cynosurus echinatus.

Cyperus vegetus.

Dactylis Aschersoniana.

Danthonia Thomasoni.

Delphinium Ajacis.
Barlowi.
cashmirianum
dyctiocarpum.
elatum.
grandiflorum.
hybridum.
Maackianum.
occidentale.
pictum.
Pylzowi.
speciosum.
— var. glabratum.
— var. turkestanicum.

Deschampsia caespitosa.
calycina.

Dianthus ambiguus.
arenarius.
caesius.
capitatus.
cruentus.
giganteus.
petraeus.
pruinosus.
pungens.
Seguieri.
superbus.
sylvestris.
Waldsteinii.

Digitalis ambigua.
ferruginea.
lutea.

Dipcadi serotinum.

Dipsacus asper.
atratus.
Fullonum.
inermis.
plumosus.

Doronicum Orphanidis.

Dorycnium herbaceum.

Downingia elegans.

Draba altaica.
Athoa.
carinthiaca.
cuspidata.
fladnizensis.
frigida.
grandiflora.
incana.
Kotschyi.
Salomoni.
streptocarpa.

Dracocephalum moldavicum.
peregrinum.
Ruyschiana.
— var. japonicum.

Dracunculus vulgaris.

Dryas octopetala.

Drypis spinosa.

Ecballium Elaterium.

Eccremocarpus scaber.

Echinaria capitata.

Echinodorus ranunculoides.

Echium plantagineum.
rubrum.

Elsholtzia cristata.

Elymus canadensis.
Caput-Medusae.
condensatus.
giganteus.

Emilia flammea.

Encelia calva.

Epilobium Dodonaei.
montanum.
nummularifolium.

Eragrostis elegans.
maxima.

Eremurus Bungei.

Erigeron alpinus.
glabellus.
macranthus.
philadelphicus.
rupestris.

Erinus alpinus.

Erodium Botrys.
chium.
ciconium.
gruinum.
malacoides.
Manescavi.
moschatum.
pelargoniflorum.
romanum.

Eruca sativa.

Eryngium amethystinum.
dichotomum.
giganteum.
maritimum.
Oliverianum.
planum.

Erysimum ochroleucum.
Perofskianum.

Erythronium giganteum.
Hartwegii.
revolutum.

Eschscholzia caespitosa.
californica.

Eucharidium Breweri.
concinnum.

Eupatorium ageratoides.

Euphorbia altissima.
coralloides.

Fedia Cornucopiæ.

Felicia fragilis.
tenella.

Festuca bromoides.
Eskia.
glauca.
Halleri.
heterophylla.
Myuros.
rigida.
tenuiflora.

Foeniculum dulce.
virescens.

Fritillaria askabadensis.
citrina.
pudica.
tenella.
Tuntasia.

Funkia ovata.
Sieboldiana.

Gaillardia aristata.

Galega orientalis.

Galeopsis pyrenaica.
Tetrahit.

Gastridium australe.

Gaudinia fragilis.

Gentiana asclepiadea.
Cruciata.
decumbens.
lutea.
tibetica.

Geranium albanum.
albiflorum.
Endressi.
grandiflorum.
incisum.
nepalense.
nodosum.
palustre.
rivulare.

Gerbera Anandria.
Bellidiastrum.
kunzeana.
nivea.

Geum Heldreichii.
macrophyllum.
montanum.
pyrenaicum.
triflorum.

Gilia androsacea.
capitata.
densiflora.
liniflora.
squarrosa.
tricolor.

Glaucium corniculatum.
flavum.
— var. fulvum.
— var. tricolor.

Glyceria plicata.

Glycine Soja.

Glycyrrhiza echinata.
uralensis.

Grammanthus gentianoides.

Grindelia squarrosa.

Guizotia abyssinica.

Gymnolomia multiflora.

Gypsophila acutifolia.
elegans.
muralis.
Steveni.

Halenia Perrottetii.

Haplocarpha scapos .

Hastingsia alba.

Hebenstreitia tenuifolia.

Hedysarum coronarium.
esculentum.
flexuosum.
microcalyx.
neglectum.

Helenium Bigelovii.

Helianthemum Tuberaria.

Helichrysum bracteatum.
foetidum.
saxatile.

Heliophila amplexicaulis.
crithmifolia.
pendula.

Helipterum Manglesii.
roseum.

Helleborus corsicus.

Hemerocallis Dumortieri.
flava.
Middendorfii.
Sieboldi.
Thunbergii.

Heracleum Mantegazzianum.

Herniaria hirsuta.

Hesperis matronalis.

Heterospermum Xanti.

Heuchera pubescens.

Hibiscus Trionum.

Hieracium amplexicaule.
aurantiacum.
Bornmülleri.
gymnocephalum.
maculatum.
pannosum.
villosum.

Hilaria rigida.

Hippocrepis multisiliquosa.
unisiliquosa.

Holosteum umbellatum.

Hordeum bulbosum.
jubatum.
maritimum.

Hosackia purshiana.

Hunnemannia fumariaefolia.

Hyacinthus amethystinus.
azureus.

Hyoscyamus albus.
aureus.

Hypecoum grandiflorum.
procumbens.

Hypericum hirsutum.
Kotschyanum.
polyphyllum.

Iberis Amara.
pinnata.
tenoreana.

Impatiens fulva.
Noli-tangerre.
scabrida.

Inula macrocephala.
montana.
racemosa.
Royleana.
salicina.
thapsoides.

Ionopsidium acaule.

Iris albo-purpurea.
bracteata.
Clarkei.
Delavayi.
Douglasiana.
ensata.
foetidissima.
— var. citrina.
graminea.
laevigata.
longipetala.
Milesii.
missouriensis.
prismatica.
setosa.
tectorum.
tenax.
unguicularis.
Watsoniana.

Isatis glauca.
tinctoria.
Villarsii.

Isopyrum fumarioides.

Jasonia tuberosa.

Juncus alpinus.
Chamissonis.
tenuis.

Jurinea alata.
ambigua.
spectabilis.

Kniphofia rufa.
Tysoni.

Kochia arenaria.
scoparia.
—var. trichophila.

Koeleria albescens.
phleoides.
setacea.

Lactuca Bourgaei.
hastata.
macrophylla.

Lagascea mollis.

Lagurus ovatus.

Lallemantia canescens.
iberica.
peltata.
royleana.

Lamarckia aurea.

Laserpitium hispidum.
Siler.

Lasthenia glabrata.

Lathyrus angulatus.
Aphaca.
articulatus.
Cicera.
Clymenum.
cyaneus.
filiformis.
luteus.
montanus.
Nissolia.
Ochrus.
polyanthus.
setifolius.
sphaericus.
tingitanus.
undulatus.
variegatus.
venosus.

Lavatera cachemiriana.
thuringiaca.
trimestris.

Layia elegans.
glandulosa.

Lens esculenta.

Leonurus Cardiaca.
sibiricus.
tataricus.

Leontopodium alpinum.

Lepachys columnaris.

Leptosyne maritima.
Stillmanni.

Lepturus cylindricus.

Libertia formosa.
grandiflora.
ixioides.

Ligusticum alatum.
scoticum.
Seguieri.

Lilium concolor var. sinicum.
Kellogii.
Parryi.
tenuifolium.

Limnanthes alba.
Douglasii.

Linaria anticaria.
bipartita.
Broussonetii.
dalmatica.
Elatine.
maroccana.
origanifolia.
reticulata.
saxatilis.
triphylla.
tristis.
viscida.

Lindelofia spectabilis.

Linum capitatum.
flavum.
usitatissimum.

Lithospermum minimum.

Loasa hispida.
lateritia.
vulcanica.

Lobelia sessilifolia.
syphilitica.

Lolium multiflorum.
temulentum.

Lopezia coronata.

Lotus ornithopodioides.
Requienii.
Tetragonolobus.

Lunaria biennis.

Lupinus affinis.
angustifolius.
elegans.
Hartwegii.
micranthus.
nootkatensis.
pubescens.
tricolor.

Luzula albida.
nivea.

Lychnis alpina.
Coeli-rosa.
corsica.
Flos-jovis.
Githago.
Lagascae.
lapponica.

Lythrum hyssopifolia.

Madia dissitiflora.
elegans.
sativa.

Malcomia africana.
Chia.

Malope trifida.

Malva Alcea.
Duriaei.
oxyloba.

Malvastrum limense.

Mandragora officinarum.

Martynia lutea.
proboscidea.

Matricaria Tchihatchewii.

Matthiola tricuspidata.

Meconopsis aculeata.
cambrica.
heterophylla.
Wallichii.

Medicago Echinus.
littoralis.
Helix.
minima.
orbicularis.
turbinata.

Melica altissima.
ciliata.
nutans.
uniflora.

Melilotus alba.

Mentzelia Lindleyi.

Mesembryanthemum pyropeum.

Mimulus Langsdorfii
luteus.

Mirabilis divaricata.
Wrightiana.

Molinia cœrulea.

Molopospermum cicutarium.

Monolepis trifida.

Moricandia arvensis.

Morina longifolia.

Moscharia pinnatifida.

Muscari armeniacum.
comosum.
compactum.
latifolium.
paradoxum.
parviflorum.
polyanthum.
Szovitzianum.

Myagrum perfoliatum.

Myosotis alpestris.
dissitiflora.

Myosuros minimus.

Nardus stricta.

Nemesia pubescens.
strumosa.

Nemophila insignis.
maculata.
Menziesii.

Nepeta Mussini.
nuda.

Neslia paniculata.

Nicandra physaloides.

Nicotiana Langsdorffii.
paniculata.
rustica.
sylvestris.

Nigella damascena.
hispanica.
orientalis.

Nolana prostrata.

Œnanthe pimpinelloides.
silaifolia.

Œnothera nocturna.
pumila.
tenella.

Omphalodes linifolia.

Ononis alopecuroides.
hircina.
Natrix.
rotundifolia.

Onosma albo-roseum.

Ornithopus sativus.

Orobanche amethystea.
elatior.
Hederae.
ramosa.

Ostrowskia magnifica.

Oxyria digyna.

Panicum bulbosum.
capillare.
Crus-galli.
Isachne.
miliaceum.
sanguinale.

Papaver alpinum.
apulum.
arenarium.
Argemone.
commutatum.
glaucum.
laevigatum.
pavoninum.
rupifragum.
somniferum.

Parnassia palustris.

Parochetus communis.

Paspalum dilatatum.
floridanum.

Pelargonium australe.

Pennisetum longistylum.
macrourum.
Ruppellii.

Pentstemon antirrhinoides.
campanulatus.
coeruleus.
confertus.
deustus.
diffusus.
gentianoides.
gracilis.
Hartwegii.
heterophyllus.
ovatus.
pubescens.
secundiflorus.

Petunia nyctaginiflora.

Phacelia tanacetifolia.

Phleum arenarium.
alpinum.

Physalis Alkekengi.
Francheti.
peruviana.

Phlomis tuberosa.
viscosa.

Phnopsis stylosa.

Physochlaina orientalis.

Phyteuma canescens.
Michelii.
nigrum.
orbiculare.
spicatum.

Phytolacca acinosa.
bogotensis.
polyandra.

Picridium tingitanum.

Plantago amplexicaulis.
arenaria.
Candollei.
Coronopus.
Lagopus.
maritima.
maxima.
ovata.
Psyllium.
tibetica.

Platycodon grandiflorum.

Platystemon californicus.

Pleurospermum Golaka.

Plumbago micrantha.

Poa abyssinica.
nevadensis.

Podophyllum Emodi.

Polemonium mexicanum.
pauciflorum.

Polygonum alpinum var. polymorphum.
molle.
orientale.
viviparum.
Weyrichii.

Polypogon littoralis.
maritimus.
monspeliensis.

Polypteris callosa.
texana.

Portulaca grandiflora.

Potentilla arguta.
argyrophylla.
Detommasii.
gelida.
glandulosa.
gracilis.
Griffithii.
hirta.
leuconota.
mollis.
montenegrina.
nepalensis.
recta.
sericea.
tanacetifolia.
Thurberi.
tridentata.

Prenanthes altissima.

Primula denticulata.
— var. cashmiriana.
frondosa.
japonica.
pulverulenta.
rosea.
variabilis.
verticillata.

Prunella grandiflora.
hyssopifolia.

Psoralea macrostachya.
physodes.

Ranunculus asiaticus.
auricomus.
brutius.
falcatus.
trilobus.

Rehmannia angulata.

Reseda virgata.

Rhagadiolus edulis.

Rheum Emodi.
Rhaponticum.
Webbianum.

Rodgersia pinnata.
tabularis.

Roemeria hybrida.

Romulea Bulbocodium.
candida.
Columnae.
ramiflora.
Requienii.

Rudbeckia ampla.
amplexicaulis.
bicolor.
californica.
speciosa.

Rumex alpinus.
limosus.
salicifolius.

Salpiglossis variabilis.

Salsola Kali.
— var. Tragus.

Salvia Aethiopis.
argentea.
Columbariae.
glutinosa.
Horminum.
japonica.
nutans.
Przewalskii.
Schiedeana.
Sclarea.
taraxacifolia.
tiliaefolia.

Sambucus Ebulus.

Saponaria bellidifolia.
calabrica.
ocymoides.

Saussurea albescens.
discolor.

Saxifraga cartilaginea.
cochlearis.
cordifolia.
Cotyledon.
crassifolia.
crustata.
flagellaris.
lingulata.
— var. lantoscana.
Macnabiana.
rotundifolia.
tenella.

Scabiosa Boissieri.
brachiata.
Candolleana.
caucasica.
dalmatica.
gramuntia.
isetensis.
leucophylla.
longifolia.
ochroleuca.
prolifera.
Pterocephala.
pyrenaica.
speciosa.
vestina.

Scilla amethystina.
amoena.
bifolia.
Hohenhackeri.
hispanica.
Lilio-Hyacinthus.
patula.
peruviana.
pratensis.
verna.

Scolymus hispanicus.
maculatus.

Scopolia sinensis.

Scorpiurus vermiculata.

Scrophularia alata.
chrysantha.
vernalis.

Scutellaria altissima.

Secale cereale.
dalmaticum.

Securigera Coronilla.

Selinum serbicum.
vaginatum.

Senecio alpinus.
Clivorum.
Doria.
japonicus.
Ledebouri.
Ligularia.
sibiricus.
tanguticus.

Serratula coronata.

Seseli Hippomarathrum.
Libanotis.
tenuifolium.
tortuosum.

Setaria glauca.
italica.
vulpiseta.

Sidalcea candida.
malvaeflora.
neo-mexicana.

Silene alpestris.
asterias.
ciliata.
clandestina.
colorata.
conoidea.
cretica.
fimbriata.
Fortunei.
fuscata.
glauca.
italica.
juvenalis.
linicola.
longicilia.
monachorum.
noctiflora.
nutans.
odontopetala.
pendula.
quadrifida.
rubella.
saxatilis.
squamigera.
stylosa.
Tanakae.
tatarica.
tenuis.
viridiflora.
Zawadskii.

Silphium scaberrimum.
terebinthinaceum.
trifoliatum.
— var. ternatum.

Silybum eburneum.
Marianum.

Sisymbrium polyceratum.
strictissimum.
tanacetifolium.

Sisyrinchium angustifolium.
chilense.
iridifolium.
striatum.

Specularia falcata.

Spiraea lobata.

Sporobolus asper.
cryptandrus.

Stachys discolor.
græca.
grandiflora.
lanata.
longifolia.

Statice Bonduelli.
sinuata.
Suworowi.

Stipa arundinacea.
Calamagrostis.
gigantea.
papposa.
pennata.
viridula.

Succowia balearica.

Swertia longifolia.

Symphyandra Hofmanni.
pendula.

Symphytum asperrimum.

Synthyris reniformis.

Teesdalia regularis.

Tellima grandiflora.

Teucrium Botrys.
canadensis.
multiflorum.

Thalictrum angustifolium.
calabricum.
purpurascens.
squarrosum.

Thermopsis caroliniana.
fabacea.
montana.

Thlaspi perfoliatum.

Tradescantia congesta.
reflexa.

Trautvetteria palmata.

Tricyrtis latifolia.

Tridax trilobata.

Trifolium agrarium.
alpestre.
glomeratum.
Johnstoni.
leucanthum.
maritimum.
pannonicum.
Perrymondi.
physodes.
resupinatum.
scabrum.
spumosum.

Triglochin palustre.

Trigonella corniculata.
caerulea.
cretica.
Foenum-graecum.
ovalis.
polycerata.
radiata.

Trillium grandiflorum.
ovatum.

Trisetum distichophyllum.
flavescens.

Triticum Aegilops.
amyleum.
dicoccum.
monococcum.
ovatum.
polonicum.

Troximon grandiflorum.

Tulipa Lownei.

Tunica glumacea.

Tyrimnus leucographis.

Urtica pilulifera.
— var. balearica.

Valeriana pyrenaica.

Valerianella Auricula.
dentata.
echinata.
eriocarpa.

Veratrum californicum.
nigrum.

Verbascum Blattaria.
longifolium.
phœniceum.

Verbena bonariensis.
erinoides.
urticaefolia.

Verbesina encelioides.
helianthoides.

Veronica glauca.
incana.
Lyallii.
saxatilis.
virginica.
— var. japonica.

Vesicaria grandiflora.

Vicia atropurpurea.
canescens.
gigantea.
hirsuta.
narbonensis.
pisiformis.
sicula.
sylvatica.
unijuga.

Vincetoxicum fuscatum.
nigrum.
officinale.

Viola arenaria.
cornuta.
persicifolia.
sagittata.
sylvestris.

Volutarella Lippii.
muricata.

Xanthium macrocarpum.
spinosum.

Xanthocephalum gymnospermoides.

Ziziphora tenuior.

Zygadenus elegans.
glaberrimus.
muscitoxicum.

TREES AND SHRUBS.

Those marked with an asterisk were not grown at Kew.

Acanthopanax sessiliflorum.
spinosum.

Acer circinatum.
coriaceum.
Heldreichi.
macrophyllum.
pennsylvanicum.
Trautvetteri.

Ailanthus glandulosa.

Alnus cordifolia.
firma.
incana.
japonica.
viridis.

Amorpha canescens.

Andrachne colchica.

Aplopappus ericoides.

Aralia chinensis.

*Arbutus Menziesii.

*Arctostaphylos Manzanita.
*pungens.
*tomentosa.

Berberis aetnensis
aristata.
concinna.
Darwinii.
sinensis.
stenophylla.
Thunbergi.
Wallichiana.

Betula davurica.
fruticosa.
humilis.
humilis var. Grayi.
— kamtschatica.
lenta.
papyrifera.
ulmifolia.

Bruckenthalia spiculifolia.

Buddleia albiflora.
Hemsleyana.
japonica.
variabilis.

Calycanthus floridus.
occidentalis.

Caragana arborescens.
— var. Redowskii.
aurantiaca.
brevispina.

Carmichaelia australis.
flagelliformis.

Cassinia fulvida.

Ceanothus americanus.
— var. opacus.
Arnoldi.

Celastrus articulatus.

*Celtis glabrata.
occidentalis.

Cephalotaxus drupacea.
Fortuni.

Chimonanthus fragrans.

*Cistus corbariensis.
florentinus.
hirsutus.
laurifolius.
purpureus.
villosus.

Clematis aethusifolia.
— var. latisecta.
Bergeroni.
connata.
crispa.
Flammula.
globosa.
Hendersonii.
parviflora.
Pitcheri.
Viticella.

Clerodendron trichotomum.

Clethra acuminata.

Colutea arborescens.
cruenta.
longialata.

Cornus Amomum.
candidissima.
circinata.
macrophylla.
pubescens.
stolonifera.

Coronilla Emerus.

Cotoneaster affinis.
bacillaris.
frigida.
laxiflora.
Lindleyi.
microphylla.
pannosa.
pekinensis.
Simonsii.
thymifolia.
uniflora.

*Crataegus Arnoldiana.
Carrièrei.
*cibaria.
*coccinoides.
cordata.
Dippeliana.
*gravida.
melanocarpa.
mexicana.
pentagyna.
punctata.
Pyracantha.
sinaica.
succulenta.

*Cupressus Lawsoniana.
thyoides.

Cydonia Maulei.

Cyrilla racemiflora.

Cytisus albus.
biflorus.
capitatus.
leucanthus.
monspessulanus.
nigricans.
purgans.
purpureus.
sessilifolius.

Daboëcia polifolia.

Desmodium viridiflorum

Deutzia corymbosa.
crenata.

Diervilla rivularis.
sessilifolia.
— var. splendens.

*Dirca palustris.

Dorycnium suffruticosum.

Elaeagnus multiflora.
umbellata.

Enkianthus campanulatus.

Escallonia Philippiana.
rubra.

Euonymus latifolius.
oxyphyllus.

Exochorda Alberti.

Fraxinus excelsior var. heterophylla.

Gaultheria procumbens.
Shallon.

Genista aethnensis.
germanica.
hispanica.
pilosa.
radiata.
sagittalis.
virgata.

Halesia hispida.
tetraptera.

Helianthemum formosum.
halimifolium.
polifolium.

Hippophaë rhamnoides.

Hydrangea arborescens.
aspera.
Bretschneideri.
paniculata.
petiolaris.
vestita.

Hymenanthera crassifolia.

Hypericum Androsaemum.
aureum.
*Coris.
densiflorum.
elatum.
hircinum.
inodorum.
lysimachioides.
Moserianum.
patulum var. Henryi.
prolificum.
uralum.

Idesia polycarpa.

Ilex cornuta.
opaca.
verticillata.

Indigofera Gerardiana.
hebepetala.

Jasminum fruticans.
humile.

*Juniperus monosperma.
phoenicea.
*sabinioides.

Kalmia angustifolia.
glauca.
latifolia.

Laburnum alpinum.
Parksii.
Vossii.

*Larix leptolepis.

Ledum palustre.

Lespedeza bicolor.

Leycesteria formosa.

Ligustrum medium.

*Liriodendron Tulipifera.

Lonicera alpigena.
depressa.
involucrata.
Maximowiczii.
minutiflora.
Morrowii.
muscaviensis.
nigra.
oblongifolia.
pileata.
pyrenaica.
Regeliana.
segreziensis.
Sullivanti.
translucens.
Xylosteum.

Lupinus arboreus.

Lycium pallidum.

*Magnolia Kobus.

Metaplexis Stauntoni.

Microglossa albescens.

Myrica cerifera.

Neillia amurensis.
capitata.
opulifolia.
Torreyi.

Notospartium Carmichaeliae.

Nuttallia cerasiformis.

*Nyssa aquatica.

Olearia Haastii.

Ononis arragonensis.
fruticosa.
rotundifolia.

Pernettya mucronata.

Petteria ramentacea.

Philadelphus acuminatus.
coronarius.
Gordonianus.
Lewisii.

Picrasma quassioides.

Pieris japonica.

*Pinus muricata.
*Parryana.

*Platanus cuneata.
orientalis.

Potentilla Friedrichseni.
fruticosa.

Prunus acida var. semperflorens.
*australis.
Besseyi.
cornuta.
*hortulana.
japonica.
*maritima.
Maximowiczii.
*orthosepala.

Prunus acida var. *pendula.
*pensylvanica.
*Pseudo-cerasus.
*siberica.
*virginiana.
*Watsoni.

Ptelea trifoliata.

Pyrus arbutifolia.
nigra.
Ringo.

Rhamnus carniolica.
crenata.
libanotica.
spathulifolia.

Rhododendron racemosum.
Rhodora.

Rhodotypus kerrioides.

Rhus aromatica.
*glabra.
*Osbeckii.

Ribes alpinum.
*curvatum.
mogollonicum.

Rosa lucida alba.

Rubus biflorus.
calycinus.
crataegifolius.
deliciosus.
leucodermis.
melanolasius.
Millspaughii.
neglectus.
nutkanus.
occidentalis.
parvifolius.
phoenicolasius.
spectabilis.
strigosus.
xanthocarpus.

Ruta graveolens.
montana.

Sambucus canadensis var
maxima.
melanocarpa.

Schizandra chinensis.

*Smilax laurifolia.

Sophora viciifolia.

Spartium junceum.

Spiraea Aitchisoni.
bullata.
concinna.
Douglasi.
expansa.
Foxii.
Lindleyana.
Nobleana.
pachystachys.
tomentosa.

Staphylea colchica.
Coulombieri.
pinnata.

Stephanandra Tanakae.

Styrax japonica.

Symphoricarpus Heyeri.
mollis.
occidentalis.
racemosus.
rotundifolius.

Symplocos crataegoides.

Thuya japonica.
orientalis.

*Tilia cordata.
*Michauxi.

Vaccinium corymbosum.
hirsutum.
padifolium.

Viburnum dentatum.
dilatatum.
Lantana.
molle.
phlebotrichum.
Sargenti.

*Zanthoxylum alatum.
Bungei.

Zenobia speciosa.
— var. pulverulenta.

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ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1908.

NEW GARDEN PLANTS OF THE YEAR 1907.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1907. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1907, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and well-marked varieties, hybrids, whether introduced or of garden origin, have been included where they have been described with formal botanical names. Mere cultural forms of well-known garden plants are omitted, for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

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An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviations used to indicate them, are as follows :—*B. H. B.*—Bulletin de l'Herbier Boissier. *B. K.*—Guerke, Blühende Kakteen. *B. M.*—Botanical Magazine. *B. M. H. N.*—Bulletin du Muséum d'Histoire Naturelle, Paris. *B. P.*—Bollettino del R. Orto Botanico di Palermo. *B. S. B. F.*—Bulletin de la Société Botanique de France. *B. S. D. F.*—Bulletin de la Société Dendrologique de France. *B. T. O.*—Bullettino della R. Società Toscana di Orticultura. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *G. W.*—Gardening World. *Henk. Nymph.*—F. Henkel, Das Buch der Nymphaeaceen. *I. S. H. T.*—Icones Selectæ Horti Thenensis. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. H. F.*—Journal de la Société Nationale d'Horticulture de France. *J. R. H. S.*—Journal of the Royal Horticultural Society. *K. B.*—Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew. *Lemoine Cat.*—Lemoine, Catalogue. *M. D. G.*—Mitteilungen der Deutschen Dendrologischen Gesellschaft. *M. K.*—Monatsschrift für Kakteenkunde. *N. B.*—Notizblatt des Königl. botanischen Gartens und Museums zu Berlin. *O. G. Z.*—Oesterreichische Garten-Zeitung. *O. R.*—Orchid Review. *Orch.*—Orchis. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Sargent, T. & S.*—Sargent, Trees and Shrubs. *S. M. C.*—Smithsonian Miscellaneous Collections. *Späth Cat.*—L. Späth, General Nursery Catalogue. *T. H.*—La Tribune Horticole. *Veitch Nov.*—J. Veitch & Sons, List of Novelties.

The abbreviations in the descriptions of the plants are :—*diam.*—Diameter. *ft.*—Foot or Feet. *G.*—Greenhouse. *H.*—Hardy. *H. H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

Abies concolor aurea. (*M. D. G.* 1906, 144.) Coniferae. H. The young shoots in May are golden-yellow, afterwards gradually becoming silver-gray. (C. Ansorge, Klein Flottbek, Hamburg.)

Abies concolor brevifolia. (*M. D. G.* 1906, 144.) H. The leaves are short and obtuse, and twice as broad as in the typical form. (C. Ansorge, Klein Flottbek, Hamburg.)

Acer Heldreichii purpuratum. (*M. D. G.* 1906, 212.) Sapindaceae. H. Leaves red beneath. (Fritz Graf von Schwerin, Wendisch-Wilmersdorf, Germany.)

***Aconitum gymnandrum.** (*B. M.* t. 8115.) Ranunculaceae. H. An annual with an erect stem reaching a height of 3 ft. Leaves usually ¾-2 in. long, 1-1½ in. broad, deeply divided, with narrow acute lobes. Flowers in a raceme or panicle. Upper sepal helmet-shaped, narrow, green except the coloured margins ; lateral violet to deep blue, spreading, clawed. Tibet and West China. (Kew.)

***Aconitum Napellus** var. **eminens.** (*B. M.* t. 8152.) H. A very tall-growing variety, reaching a height of 9 ft. or more. The flowers are more gaping than in the type, and the helmet taller. Rhenish Prussia. (O. Stapf.)

Aerides Duquesnei. (*J. H. F.* 1906, 777.) Orchidaceae. S. Flowers white dotted with rose. Native country not stated. (A. Régnier, Fontenay-sous-Bois, Seine, France.)

Aeschynanthus macrocalyx. (*N. B.* iv. 314, t. 1.) Gesneraceae. S. A scandent epiphyte with slender terete branches. Leaves opposite, shortly stalked, fleshy, oblong, 4–5 in. long, 1–1½ in. broad, acuminate. Flowers axillary, solitary, shortly stalked. Calyx about 1¼ in. long, with narrowly lanceolate acuminate

lobes. Corolla exserted, cylindric-funnel-shaped, slightly curved and enlarged in the upper part, scarlet, with dark purple nerves and spots. Siam. (Berlin B. G.)

Aesculus Pavia roseo-variegata. (*M. D. G.* 1906, 211.) Sapindaceae. H. Young leaves rose-red, with green blotches. The reddish colour later on changes to yellow, and finally the whole leaf becomes green. (R. Behnsch, Dürrgoy, Breslau.)

***Agapetes speciosa.** (*G. C.* 1907, xli. 224, 230, f. 101 ; *G. M.* 1907, 292.) Ericaceae. G. A new species allied to *C. setigera* var. *Roylei*, differing in having larger leaves auricled at the base, larger flowers, and shorter deltoid calyx-lobes. Leaves clustered at the end of each year's shoot, ovate-oblong, 3¼–4 in. long, 1¼–2 in. broad. Corolla deep crimson, tubular, ventricose in the middle, 1½–1¾ in. long, 7½ lin. broad in the middle, 5-ribbed. Native country unknown, probably Burma. (J. T. Bennett-Poë.)

Agave parrasana. (*N. B.* iv. 250.) Amaryllidaceae. G. A new species with a very distinct habit. Leaves about 30, in a dense rosette, erect from a very fleshy base, smooth, 3⅓ in. broad at the base, nearly 4 in. broad at the middle, almost ovate in the upper part, deeply concave above, convex beneath, with a stout terminal spine ; margins at the base entire or with small or minute prickles, in the upper part furnished with stout hooked or variously bent ones. Mexico. (La Mortola.)

***Agave Watsoni.** (*K. B.* 1907, 322.) G. A new species allied to *A. horrida*, but it is distinguished from that species and others of the same group by the extremely narrow border of the leaf. The leaves are 15–20 in number, narrowly oblong-lanceolate, about 20 in. long, with straight or slightly hooked marginal spines about 2½ lin. long and ¾ in. apart. Scape nearly 18 feet high. Probably Central America. (Kew.)

Ailantus Giraldii. (*B. S. D. F.* 1907, 191, ff.) Simarubaceae. H. Near *A. glandulosa*, but the leaves are longer with more numerous narrower long-acuminate leaflets, set much more closely together, and the almost flat fruits are larger. Shensi and Szechuen, China. (Barbier & Co., Orleans ; M. L. de Vilmorin, Les Barres, France.)

Ailantus sutchuenensis. (*B. S. D. F.* 1907, 192, ff.) H. Closely allied to *A. glandulosa*. It differs in having the leaflets apparently glabrous, not ciliate, narrower at the base, and furnished with spreading teeth. Inflorescence larger, 12–16 in. long, glabrous. Fruits nearly flat, larger, up to 2½ in. long and nearly ½ in. broad. Central China. (M. L. de Vilmorin, Les Barres, France.)

Alluaudia sp. (*R. H.* 1907, 493, f. 165.) Didiereaceae. S. The genus closely resembles Didierea, which was included in the List of 1898. It consists of a few species of small trees with tufted spiny branches, quite destitute of leaves except in the young state, and bearing cymes of inconspicuous flowers. The name of the species in cultivation is not recorded. Madagascar. (Paris B. G.)

Aloe pallidiflora. (*B. M.* t. 8122.) Liliaceae. G. A stemless plant. Leaves in a dense rosette, linear-lanceolate, about 14 in. long, 2½–3 in. broad, dull green above and marbled with long whitish marks, armed on the margins with sharp spines up to ¼ in. long. Inflorescence 2½–4 ft. high, branched. Flowers pale flesh-colour, yellowish inside, 1¼ in. long ; tube slightly constricted above the ovary, curved near the throat. South Africa ? (Sir T. Hanbury, La Mortola.)

Amomum unifolium. (*B. S. B. F.* 1907, 403.) Scitamineae. S. A herb about 1¾ ft. high. Leaf 1 (rarely 2), ovate, stalked, 9 in. long, about 3 in. broad, abruptly acute, glabrous and glaucescent. Scape none or short. Spike half-immersed in the soil, ovate, 1¼ in. long, rose. Calyx spathe-like, rose. Corolla-tube 1¾ in. long, glabrous ; lobes alternately equal, ovate, obtuse, ¾ in. long, ¼ in. broad. Indo-China. (Paris B. G.)

***Ampelopsis Lowi.** (*G. C.* 1907, xlii. 253 ; *Gard.* 1907, lxxi. 516, f. ; *R. H. B.* 1907, 388, f.) Ampelidaceae. H. Raised from seed of *A. Veitchii*. It is more slender in habit than that species. Leaves somewhat cordate, deeply lobed, dark purple in autumn ; lobes usually 7, acute. (H. Low & Co.) [*Vitis inconstans Lowi* ; G. M. 1907, 718, 726, f. ; G. W. 1907, 698.]

***Ampelopsis Saint-Paulii.** (*R. H.* 1907, 567.) H. A vigorous-growing species, covered on the ends of the branches and on the young leaves with

a velvety pubescence. Tendrils as in *Vitis inconstans*. Leaves long-stalked, with 5 long-stalked elliptic leaflets 8 in. long and 3 in. broad, long-acuminate, dark green and glabrous above, paler and pubescent on the nerves beneath. Inflorescence very large (about 6 in. long), pyramidal, loose. Probably native of North America. [Syn. *Parthenocissus Saint-Paulii*, Koehne & Graebn. in *Gfl.* 1900, 250, 283. =*Vitis*.]

***Ancistrochilus Rothschildianus.** (*G. C.* 1907. xli. 51, ff. 24, 25.) Orchidaceae. S. A new species differing from *A. Thomsonianus* in being larger, with rather more fleshy leaves and flowers, in having broader sepals, the two lower being distinctly connivent, and a shorter front lobe to the lip, which has the side lobes heavily tinged with sepia-brown, instead of being spotted. Nigeria. (Hon. W. Rothschild.)

***Anemone Bungeana.** (*Gard.* 1907, lxxi. 214.) Ranunculaceae. H. A distinct species similar in habit to *A. Pulsatilla*, with the same finely-divided leaves, but the segments are not so long. Flowers golden-yellow. Siberia. (Kew.)

Anemone elongata. (*G. C.* 1907, xlii. 127.) H. Similar to *A. sylvestris* in habit and foliage, but it is much less beautiful. The flowering-stems reach a height of about $1\frac{3}{4}$ ft., and the erect flowers are scarcely 1 in. across, dull greenish white, with bright green anthers. Himalaya. (S. Arnott.) [An old garden plant re-introduced.]

***Anemone magellanica.** (*Gard.* 1907, lxxi. 77.) H. A pretty but not showy species. Leaves prostrate, deeply lobed, slightly hairy. Flowers yellow, 1 in. across, raised slightly above the leaves. Straits of Magellan. [= *A. multifida*, Poir.]

***Angraecum Buyssoni.** (*G. M.* 1907, 885; *G. C.* 1907, xlii. 381.) Orchidaceae. S. A very strong-growing species resembling *A. articulatum*. Stems elongated, with stiff green leaves in 2 rows. Flowers moderately large, pure white, with long slightly brown spurs. Madagascar. (Charlesworth & Co.) [See *L'Orchidophile*, 1887, 281, and 1891, 282. Apparently first introduced into Europe in 1887, when it was figured and described as *A. du Buyssonii*.]

Angraecum Scheffleri. (*Orch.* i. 70.) S. Plant scarcely 8 in. high. Leaves amplexicaul, about $3\frac{1}{2}$ in. long and $\frac{3}{4}$ in. broad, reddish brown on the underside when young, greener, with transparent reddish dots above. Racemes about 6 in. long, densely flowered; rhachis reddish brown with minute sessile bracts of a paler colour. Flowers, excluding the spur, $2\frac{1}{2}$–3 in. long, reddish brown; spur about as long again. German East Africa. (Berlin B. G.)

Angraecum Scheffleri var. **virens.** (*Orch.* i. 70.) S. Differs from the type in having all the vegetative parts green. German East Africa. (Berlin B. G.)

Angulocaste Bievreanae. (*T. H.* 1907, ii. 516, t. 57; *R. H.* 1907, 438.) Orchidaceae. G. A garden hybrid between *Anguloa Ruckeri* and *Lycaste Skinneri*. (Château Royal, Laeken, Belgium.)

Anthurium Andreanum Gameri. (*R. H.* 1907, 30) Araceae. S. Spathe rounded, about 9 in. long, 8 in. broad, strongly corrugated, very bright red, shining; spadix small, incurved, yellow at the apex. (R. Jarry-Desloges, Paris.)

Araucaria excelsa virgata. (*M. D. G.* 1906, 193.) Coniferae. G. A form in which the primary branches have no secondary branches or only short ones. (Observed in a garden in Palermo, Sicily.)

***Arctostaphylos Manzanita.** (*B. M.* t. 8128.) Ericaceae. H. A shrub or tree, up to about 30 ft. high. Leaves ovate or elliptic-ovate, $1\frac{1}{2}$–$1\frac{3}{4}$ in. long, $\frac{3}{4}$–$1\frac{1}{2}$ in. broad, obtuse or acute, coriaceous; petiole up to $\frac{1}{3}$ in. long. Flowers many, in a short ovoid or corymbose panicle. Corolla urceolate, about $\frac{1}{4}$ in. long, white or pinkish. California. (Kew.)

Astilbe. (*Lemoine Cat.* n. 167, iii.; *R. H.* 1907, 535; *Jard.* 1907, 371.) Saxifragaceae. H. The following garden hybrids, obtained by crossing the hybrids between *A. chinensis* and *A. Lemoinei* with *A. Davidii*, are described: *A. carminea*, *A. rubella*, and *A. rutilans*. They have rose or rose-carmine flowers, and differ slightly from one another in the size and form of the panicles. (V. Lemoine & Son, Nancy.)

***Begonia Bertini nana.** (*Lemoine Cat.* n. 165, 9.) Begoniaceae. G. A dwarf compact variety with large reddish flowers. (V. Lemoine & Son, Nancy.)

***Begonia dichroa.** (*O. G. Z.* 1907. 418.) G. A new shrubby species. Stem erect, freely branched from the base. Leaves elongate-oval, slightly undulate on the margin, sharply acuminate, shining green, dotted and blotched with white, those developed later entirely dark green. Flowers in large axillary fascicles, bright salmon-orange. Fruits whitish rose, winged. Brazil. (Haage & Schmidt. Erfurt.)

***Begonia incomparabilis.** (*R. H. B.* 1907, 60, t.) G. A garden hybrid between *B. socotrana* and a garden variety of the tuberous-rooted section. (J. Veitch & Sons.)

Begonia Pearcei × Baumanni. (*Lemoine Cat.* n. 165, 10.) G. A garden hybrid. (V. Lemoine & Son, Nancy.)

Berberis Bretschneideri. (*Sargent. T. & S.*, ii. 21, t. 110.) Berberidaceae. H. An erect shrub 6–10 ft. high, with dark red-brown terete one-year-old branches producing prominent floriferous spurs. Spines usually simple, scarcely ½ in. long. Leaves deciduous, obovate-oblong, 1¾–2½ in. long, ¾–1¼ in. broad, densely toothed (the teeth bearing long bristles pointing forward), shortly stalked, brightly coloured in autumn. Flowers pale yellow, about ⅓ in. across, in short pendent racemes. Fruit oblong, purplish, scarcely ½ in. long. North China. (Arnold Arboretum.)

***Berberis Wilsonae.** (*G. C.* 1907, xlii. 284, 372, f. 153; *Gard.* 1907, lxxi. 237, 541, f.; *J. of H.* 1907, lv. 425, f.) H. A dwarf much-branched shrub densely clothed with leaves about ½ in. long, which in the autumn become a beautiful crimson. Spines nearly 1 in. long. Flowers rich golden. Fruits nearly round, coral-red, shining. Western China. (J. Veitch & Sons.)

***Bigelovia graveolens.** (*B. M.* t. 8155.) Compositae. H. A shrub 6–8 ft. high. Stem much branched upwards; flowering branches corymbose, pendulous, tomentose, white. Leaves alternate, crowded, linear, 1–3 in. long, acute. Flower-heads very numerous, shortly stalked, 5-flowered, corymbosely arranged. Flowers yellow, all tubular. North America. (Kew.)

***Blepharocalyx spiraeoides.** (*B. M.* t. 8123.) Myrtaceae. G. A new species. It is a much-branched free-flowering shrub reaching a height of 9 ft. Leaves lanceolate-linear, ⅓–¾ in. long, 1/12–⅜ in. broad, very shortly stalked. Flowers small, pale yellow, in dense terminal panicles. Petals 4, broadly elliptic, ⅛ in. long. Brazil. (Kew.) [Previously known in gardens under the name of *Eugenia myriophylla*.]

Brasso-cattleya Alexanderi. (*O. R.* 1907, 125.) Orchidaceae. S. A garden hybrid between *Cattleya citrina* and *Brassavola Digbyana*. (G. L. Holford.)

Brasso-cattleya Hyeae. (*O. R.* 1907, 113, f. 12.) S. A garden hybrid between *Cattleya Harrisoniana* and *Brassavola Digbyana*. (G. L. Holford.)

Brasso-cattleya Thorntonii. (*G. C.* 1907, xli. 413.) A garden hybrid between *Brassavola Digbyana* and *Cattleya Gaskelliana*. (J. Chamberlain.)

Brasso-laelia Jessopii. (*O. R.* 1907, 191.) Orchidaceae. G. A garden hybrid between *Laelia xanthina* and *Brassavola Digbyana*. (G. M. Jessop.)

Brasso-laelia Thwaitesii. (*O. R.* 1907, 264.) G. A garden hybrid between *Laelia grandiflora* and *Brassavola Digbyana*. (R. G. Thwaites.)

Brasso-laelia westfieldiensis. (*O. R.* 1907, 52.) G. A garden hybrid between *Brassavola glauca* and *Laelia flava*. (F. Wellesley.)

***Bulbophyllum Binnendijkii.** (*G. C.* 1907, xlii. 161.) Orchidaceae. S. Allied to *B. Ericssonii* from which it differs in having a rigid upright dorsal sepal, marked, as well as the other segments, with larger purple spots, and in the darker colour of the lip. Java. (F. Sander & Sons.)

Bulbophyllum dichromum. (*K. B.* 1907, 128; *B. M.* t. 8160.) S. A new species allied to *B. fuscopurpureum*. An epiphytic herb, with a stout woody rhizome. Pseudobulbs ovoid-oblong, about 2 in. long, 1-leaved. Leaf oblong, about 6 in. long. Scape

suberect, 9–10 in. long. Raceme lax, about 12-flowered. Flowers conspicuous, rather large, deep yellow, with a dark purple lip. Annam. (Glasnevin B. G.)

Bulbophyllum fuscopurpureum. (*O. R.* 1907, 188.) S. Rhizome stout, woody. Pseudobulbs yellowish, tetragonal, 1-leaved. Leaves shortly stalked, oblong, 3–4 in. long. Scapes about 6 in. long, 6- or 7-flowered at the apex. Flowers about 1 in. across, dull reddish brown, darker on the lip. Petals about ½ in. long, broadly triangular at the base, with a filament-like extension clubbed at the apex. Lip with a pair of curved basal side-lobes. Southern India. (J. O'Brien.)

Bulbophyllum galbinum. (*G. C.* 1907, xlii. 42, f. 14.) S. Very closely related to *B. Reinwardtii*, but this species has a much narrower lip, and the sepals and petals have a greener ground colour. The flowers of *B. galbinum* are yellow, with reddish lines and crimson dots. Perak. (Lord Rothschild.)

Bulbophyllum inunctum. (*O. R.* 1907, 22.) S. Flowers larger than in B. Lobbii, with the sepals longer and densely dotted with purple on a light ground. Petals long and drooping, bearing a few purple stripes. Borneo. (Buitenzorg B. G.)

Bulbophyllum tridentatum. (*K. B.* 1907, 128.) S. A new species near *B. mandibulare*. Leaves elliptic-oblong, 6 in. long, about 1 in. broad; petiole 1 in. long. Scape 1–1¾ in. long, 2- or 3-flowered. Sepals 1–2 in. long, dull yellowish green, spotted with dull purple. Petals ½ in. long, coloured like the sepals. Lip fleshy, recurved, acute, about ½ in. long, light brown, suffused with purple on the sides and apex. Column green, with 3-toothed arms. British New Guinea. (F. Sander & Sons.)

Cactus Maxonii. (*S. M. C.* 1. 63, t. 6.) Cactaceae. G. Stem broadly cone-shaped or cylindrical, 4–6 in. high, crowned with a mass of white wool and brown bristles, broadly 11–15-ribbed. Spines usually 9, ½–¾ in. long, pale red or rose-coloured with a whitish bloom, the radial spreading or recurved, and the 1 or sometimes 2 central ones shorter and standing nearly at right angles to the rib. Flowers small, rose-coloured. Guatemala. (Washington B. G.)

***Caesalpinia vernalis.** (*B. M.* t. 8132.) Leguminosae. G. A tall climbing prickly shrub. Leaves bipinnate, with 9–12 pairs of pinnules; pinnules ovate, ½–1 in. long. Flowers in racemes about 6 in. long. Petals ovate, lemon-yellow, the uppermost one smaller than the others and marked with a scarlet blotch. China. (Kew.)

Calanthe burmanica. (*K. B.* 1907, 129.) Orchidaceae. S. Leaves elliptic-lanceolate, acuminate, stalked: blade 8–10 in. long, 1¼–2¼ in. broad. Scape erect, about 18 in. high. Raceme 4 in. long, many-flowered. Flowers mauve-purple, with a yellow crest. Sepals elliptic-ovate, about ½ in. long. Petals elliptic or elliptic-lanceolate, 5–6 lin. long. Lip deeply 3-lobed, adnate to the column, 7–8 lin. long. Burma. (Glasnevin B. G.)

***Calliandra portoricensis** var. **major.** (*B. M.* t. 8129.) Leguminosae. G. A shrub or small tree, with bipinnate leaves and large dense heads of flowers, which are conspicuous on account of the very numerous long pure white stamens. It differs from the type in having deltoid calyx-lobes and longer stamens. Central America. (Kew.)

***Campanula incurva.** (*J. R. H. S.* xxxii. 205.) Campanulaceae. H. A perennial herb with a simple ascending stem 1 ft. high or more. Leaves stalked, cordate, white, downy, crenate, much rounded at the apex, 2–3 in. long and broad. Calyx-lobes ovate-acuminate, ½ in. long, ¼ in. broad. Corolla enlarged-campanulate, pale blue, 1½ in. long. Greece. [= *C. Leutweinii*, Heldr.]

***Campanula Kolenatiana.** (*J. R. H. S.* xxxii. 207.) H. A perennial many-stemmed herb, up to about 9 in. high. Leaves chiefly radical, ovate, about 1 in. long, on long winged petioles. Flowers in a long-stalked raceme. broadly campanulate-funnel-shaped, bluish violet, 1 in. long, hairy inside. Caucasus.

Campanula Medium imperialis. (*Gfl.* 1907, 659; *T. H.* 1907, ii. 514.) H. An exceptionally floriferous variety or possibly a hybrid. (Pape & Bergmann, Quedlinburg, Germany.)

***Campanula petraea.** (*G. C.* 1907, xlii. 197, f. 84.) H. A biennial herb. Stem ascending, angular, 6–12 in.

high, covered with grey hispid hairs. Lower leaves elongated, lanceolate-oblong, narrowed to the base, toothed; upper ovate, sessile. Flowers small, pale yellow, in a dense terminal head and in numerous almost sessile smaller axillary heads. Northern Italy. (W. E. Gumbleton.)

Campanula rotundifolia var. **alaskana**. (*G. C.* 1907, xlii. 126.) H. Somewhat dwarfer than the variety *pallida*, with large flowers of much the same shade of blue. (S. Arnott.)

Caragana arborescens forma **Lorbergi**. (*M. D. G.* 1906, 61.) Leguminosae. H. Leaflets only ¼–1 lin. or occasionally 2 lin. broad. Standard much narrower than in the type, sometimes with a tooth about ½ lin. long in the middle of the margin.

***Caralluma Nebrownii**. (*N. B.* iv. 249.) Asclepiadaceae. G. Branches robust, erect or ascending, 4-angled, glabrous, 6–7 in. long, about 1¾ in. across; angles flattened, large-toothed, deeply sinuate between the teeth, green or glaucescent, densely spotted with dull purple. Flowers about 13, subumbellate. Pedicels 2½–3 in. long. Corolla about 2½ in. across, deeply 5-lobed; lobes ovate-lanceolate, acute, with purple club-shaped hairs on the margin. German South-West Africa. (La Mortola.)

Catalpa bignonioides var. **Koehnei**. (*B. S. D. F.* 1907, 206.) *Bignoniaceae.* H. Leaves pallid, golden, the middle of the limb with irregular angular green blotches. (Simon-Louis frères, Plantières, near Metz.)

***Catalpa Bungei**. (*K. B.* 1907, 102.) H. A handsome tree 20–30 ft. high. Leaves relatively rather small, ovate-acuminate, 1½–7½ in. long, up to 4½ in. broad, truncate or cuneate at the base, often coarsely 5- or 6-toothed each side, sometimes entire. Inflorescence corymbose, 3–12-flowered. Corolla purple and white, 1½ in. long and broad. The plant frequently grown as *C. Bungei* is *C. Kaempferi* or a dwarf variety of *C. bignonioides*. China. (Kew.)

***Catalpa Duclouxii**. (*B. S. D. F.* 1807, 201, f.) H. A new species remarkable in having rose-coloured flowers. Leaves deltoid-cordate, entire, glabrous. Inflorescence corymb-shaped, 6–15-flowered or more. (L. A. Dode, Paris.)

Catalpa Galleana. (*B. S. D. F.* 1907, 205, f.) H. A garden hybrid between *C. Kaempferi* and possibly *C. cordifolia*. (E. Gallé, Nancy.)

Catalpa Henryi. (*B. S. D. F.* 1907, 199, f.) H. A tree with large deltoid leaves, cordate at the base, acuminate, entire or sometimes with a single lobe, rarely tricuspidate, the younger puberulous both sides, the older glabrescent beneath. Inflorescence corymb-like. Flowers numerous, small, as in *C. Kaempferi*. Seeds small, brown. China and Japan. (M. L. de Vilmorin, Les Barres, France.)

Catalpa heterophylla. (*B. S. D. F.* 1907, 203, f.) H. Very near *C. Bungei*, but the inflorescence consists of fewer flowers (3–5 instead of 4–12), and the buds are glabrous, not pubescent at the base. The odour of the leaves is not so fetid, and the masses of the glands are red-brown instead of green. North China. (M. L. de Vilmorin, Les Barres, France.) [Syn. *C. Bungei* var. *heterophylla*, C. A. Meyer.]

Catalpa japonica. (*B. S. D. F.* 1907, 200, f.) H. A new species differing from *C. Kaempferi* in having less lobed leaves, and a narrower compact pyramidal inflorescence due to the shortness of the lower secondary axes, which are also markedly slender. The flowers are of a purer white, and are fragrant. Japan. (Simon-Louis frères, Plantières, near Metz.)

***Catalpa Teasiana**. (*B. S. D. F.* 1907, 205, f.) H. A garden hybrid between *C. Kaempferi* and probably *C. cordifolia*. See *Garden and Forest*, 1889, 303, f.

Catasetum Rhamphastos. (*Orch.* ii. 25.) Orchidaceae. S. A new species in habit and size resembling *C. tabulare*. Raceme few-flowered, up to 10 in. long, with a few small triangular bracts. Flowers about 4 in. across. Sepals oblong-lanceolate, acute, pale green, obscurely rose-dotted, about 1¾ in. long, 4 lin. broad. Petals oblong, acute, about the same size as the sepals, pale green. Lip pale green, oblong, 1¾ in. long, 7½ lin. broad, with a callus on the disk 1¼ in. long. Andes of Colombia. (O. Beyrodt, Marienfelde, Berlin.)

Cattleya Armstrongiae. (*G. C.* 1907, xlii 190; *O. R.* 1907, 307.) Orchidaceae. G. A garden hybrid between *C. Hardyana* and *C. Loddigesii violacea*. (Armstrong & Brown.)

Cattleya bahiensis. (*O. R.* 1907, 279.) S. A natural hybrid between *C. velutina* and *C. Warneri*. (Marquis de Wavrin, Château de Ronsele, Ghent.) [= *C.* × *spectabilis*; *O. R.* 1907, 316.]

Cattleya Castraeana. (*G. C.* 1907, xlii. 221; *O. R.* 1907, 309.) A garden hybrid between *C. Loddigesii* and *C. Hardyana*. (F. Sander and Sons.)

Cattleya Frankeana. (*O. R.* 1907, 280.) S. A natural hybrid apparently between *C. velutina* and *C. Schilleriana*. (T. Franke, Gross-Ottersleben, near Magdeburg, Germany.)

Cattleya Mossiae var. **alba sulphurea.** (*T. H.* 1907, ii. 4, t. 21.) G. A very fine variety, the flowers having white sepals and petals, and a sulphur-yellow lip, white at the margin. (F. Lambeau, Brussels.)

Cattleya spectabilis. See **C. bahiensis.**

Cattleya Trianae Mooreana. (*G. C.* 1907, xli. 226; *O. R.* 1907, 146; *G. M.* 1907, 240.) G. Sepals and petals light rosy lilac, the latter claret-coloured at the tip. Lip deep ruby-claret colour, orange at the base. (J. Bradshaw.)

Cereus anguinus. (*M. K.* 1907, 166.) Cactaceae. G. Branches decumbent, bent in places, up to 10 lin. in diam. Ribs 10–12, 1½-2 lin. broad. Areolae 2½–5 lin. apart, orbicular, clothed with a short dark brown wool. Radial spines 18–22, hoary-white. brown at apex and base, slender, 2½–3 lin. long; central 1 or 2, stronger, hoary-yellow, sometimes absent. Flowers somewhat irregular, tubular, orange-yellow, about 3 in. long. Paraguay. (Berlin B. G.)

Cereus xanthocarpus. (*M. K.* 1907, 65.) G. Stem 4–6-ribbed, 3½ in. across, rounded or depressed and spiny at the apex; ribs smooth, usually straight; areolae 1½–1¾ in. apart, round, shortly white-tomentose, or those at the apex at first glabrous, producing 3 or 4 very short conical dark brown spines. Flowers opening at night; tube 5 in. long, yellow-green in the lower part, white-green above; segments oblong to lanceolate, ¾-2½ in. long, ⅓–¾ in. broad, the outer white-green, the inner white. Paraguay. (W. Weingart, Nauendorf, near Ohrdruf, Germany.)

Chamaecyparis Lawsoniana Depkeni. (*M. D. G.* 1906, 87.) Coniferae. H. An elegant vigorous-growing variety, with a dull yellowish-white colouring up to late autumn, when it gradually passes to green. (G. W. Depken, Oberneuland-Rockwinkel, Bremen.) [*Cupressus.*]

Chamaecyparis pisifera columnaris. (*M. D. G.* 1906, 143.) H. Thickly and equally branched from below, the whole plant assuming a columnar form. (C. Ansorge, Klein Flottbek, Hamburg.) [*Cupressus.*]

Chrysanthemum maximum Davidsii. (*Gard.* 1907, lxxi. 296.) Compositae. H. Described as a fine variety, with strong stems of great length. (R. Holmes.)

***Cirrhopetalum appendiculatum** var. **Fascinator.** (*G. C.* 1907, xlii. 254, 260.) Orchidaceae. S. The sepals and petals have a deeper purple fringe and the sepals a darker claret-coloured tint than in the type. (Sir J. Colman.)

***Cirrhopetalum biflorum.** (*O. R.* 1907, 286.) S. Scape 2-flowered. Lateral sepals elongated, very acuminate, about 2½ in. long, light green, minutely dotted with red, and with 7 purple stripes at the base. Dorsal sepal lanceolate, about ⅓ as long as the lateral, green, with 5 purple stripes. Petals broad, 3-toothed at the apex, greenish, with 3 purple stripes, pellucid-dotted. Lip much recurved, acute, mottled with brown. Java. (J. W. Moore.) [Syn. *Bulbophyllum biflorum*, Teijsm & Binn.]

Cleisostoma secundum. (*K. B.* 1907, 131.) Orchidaceae. S. Stem short. Leaves lanceolate-oblong, 3¾–5¼ in. long, about ½ in. broad. Scape decurved or subpendulous, 3–4 in. long. Flowers turned to one side, light rose-pink with the front lobe of the lip rose-purple. Sepals spreading, elliptic-oblong, 3 lin. long. Petals narrower than the sepals. Lip almost entire, elliptic-oblong, 3–3½ lin. long. Burma. (H. Low & Co.; Glasnevin B.G.)

Clematis quinquefoliata. (*G. C.* 1907, xli. 3.) Ranunculaceae. H. A new species allied to *C. Meyeniana*. It is a climbing shrub, with channelled stems at first pubescent, afterwards almost glabrous. Leaves pinnately, 5-foliolate : leaflets stalked, lanceolate or oblong-lanceolate, to 3¾ in. long and 1¼ in. broad. Flowers milky-white, borne, 5 or 6 together, on axillary peduncles shorter than the leaves. Sepals 4 or 5, oblong. Central China. (J. Veitch & Sons.)

**Clematis Sanderi.* (*G. C.* 1907, xli. 310.) G. Possibly a form of the very variable *C. aristata*. It is an evergreen plant, resembling *C. indivisa* in habit, but is less robust. Leaves narrowly lanceolate, 1–2 in. long, distinctly toothed. Flowers unisexual, in axillary clusters, sometimes a dozen or more together, fragrant. Sepals white, 1 in. long, narrow, recurved. Stamens ½ in. long, salmon-red, in a regular dense cluster. Australia. (F. Sander & Sons.)

**Clerodendron Fargesii.* (*B. S. D. F.* 1907, 207 ff.) Verbenaceae. H. A new species remarkable for the beautiful rather lax inflorescences of white flowers, which are about 1½ in. long including the stamens, and bright blue fruits encircled by a persistent intensely red calyx, borne on pedicels of the same colour. The leaves are cordate-ovate, purple when young, this colour persisting for a long time on the underside. Szechuen, China. (M. L. de Vilmorin, Les Barres, France.)

Cochlioglossa moortebeekiensis. (*J. H. F.* 1907, 428 ; *R. H. B.* 1907, 254.) Orchidaceae. G. A garden hybrid between *Odontoglossum Sceptrum* or *O. praenitens* and *Cochlioda Noetzliana*. (F. Lambeau, Brussels.)

Coelogyne Colmanii. (*G. C.* 1907, xli. 109, f. 48 ; *O. R.* 1907, 73, f. 8.) Orchidaceae. S. A garden hybrid between *C. speciosa major* and *C. cristata alba*. (J. Colman.) [Syn. *C. Colmanii magdeburgensis* ; O. R. 1907, 90.]

**Columnea glabra major.* (*Lemoine Cat.* n. 165, 2 ; n. 167, 2.) Gesneraceae. S. Stems round. Leaves sessile, small, oval, fleshy, glabrous, dark green. Flowers axillary. Corolla scarlet, 3⅓ in. long ; tube slightly curved, velvety outside ; limb 2-lipped, the upper lip of a broad rounded entire lobe, and the lower of 3 pointed reflexed lobes. Stamens white. Costa Rica. (V. Lemoine & Son. Nancy.)

**Columnea magnifica.* (*Lemoine Cat.* n. 165, 2 ; n. 167, 3.) S. Stems round, very hairy when young. Leaves shortly petiolate, rather large, ovate-lanceolate or oblong, very hairy. Flowers usually solitary in the axils of the upper leaves ; peduncle ½–¾ in. long. Corolla bright scarlet, 2½–3⅓ in. long ; tube inflated about the middle ; limb 2-lipped, 4-lobed ; upper lobe broad, arching ; lateral lobes} short, spreading ; lower lobe longer and narrower than the others, finally more or less spreading. See *G. C.* 1908, xliii. 66, f. 33. Costa Rica. (V. Lemoine & Son, Nancy.)

Comarella multifoliata. (*G.C.* 1907. xlii. 151.). Rosaceae. H. Leaves pinnate. 5–7 in. long, with small closely arranged leaflets, giving the plant a fern-like appearance. Flowers reddish-brown, inconspicuous. California. (Darmstadt B.G.) [Syn. *Potentilla depauperata*, Engelm.]

**Coreopsis bella.* (*K. B.* 1907, 364.) Compositae. H.H. An undershrub about 3 ft. high. Leaves petiolate, pinnatipartite, pubescent both sides ; segments ovate-lanceolate, acute, more or less deeply toothed. Flower-heads pedunculate. Ray-florets 12, oblong-elliptic, 12-nerved, 1¼ in. long, subacute or obscurely toothed at the apex. A very handsome new species. British East Africa. (Kew.)

Corylus Colurna var. **chinensis.** (*J. H. F.* 1907, 516.) Cupuliferae. H. Differs from the type in having the cupule prolonged above the nut into a short tube, which is divided into divaricate lobes. Western China. (M. L. de Vilmorin, Les Barres, France.) [Syn. *C. chinensis*, Franch. in Journ. de Bot. 1899, 197.]

Cotoneaster applanata. (*G. C.* 1907, xlii. 253 ; *G. M.* 1907, 726.) Rosaceae. H. A pretty graceful species, with a drooping habit. Leaves small, ovate, entire. Fruits scarlet or dark red, in clusters on branches about 1 in. long. China. (J. Veitch & Sons.)

**Cotoneaster humifusa.* (*Gard.* 1907, lxxi. 237.) H. A densely branched shrub, having long trailing shoots covered with dark green leaves. Fruits scarlet. Central China. (J. Veitch & Sons.)

Crassula atrosanguinea. (*B. H. B.* 1907, 1013, ff.) Crassulaceae. G. Stem erect, 14–20 in. high, rigid, reddish, simple at the base, branched at the apex. Leaves like those of an *Aloe*, more or less recurved or straight, glabrous, gradually narrowed from the base to the apex, 2½–8 in. long, the lower crowded in a rosette and longer than those on the stem. Flowers many in a dense terminal cymose corymb. Petals dark red, ovate-lanceolate, 1½ lin. long. Stamens exserted. Transvaal. (W. Barbey, Pierrière, Geneva.)

Crinum amoenum var. **Mearsii.** (*G. C.* 1907, xlii. 62, f. 22.) Amaryllidaceae. S. Bulb round or ovoid, up to 2 in. across. Leaves ensiform, undulate, 8–12 in. long or more, 1 in. broad. Peduncle 3–4½ in. long. Umbel 6–10 flowered. Pedicels ¼ in. long. Perianth white, salver-shaped; tube slender, up to 5 in. long; segments spreading, lanceolate, 2½ in. long, ½ in. broad. It is smaller than the type. Upper Burma. (R. H. Beddome.) [Syn. *C. Mearsii*; G. C. 1907, xlii. 35; G. M. 1907, 531.)

***Crocus speciosus** var. **albus.** (*Gard.* 1907, lxxi. 613, f.) Iridaceae. H. Flowers white. (C. G. van Tubergen, Haarlem.)

***Crocus speciosus** × **pulchellus.** (*G. C.* 1907, xlii. 332.) H. Apparently a garden hybrid between the species named. (E. A. Bowles.)

Cryptomeria japonica argenteo-spicata. (*M. D. G.* 1906, 151.) Coniferae. H. A vigorous-growing form, with silvery white-tipped shoots. (H. Hellemann, Moorende, Bremen.)

Cyclamen punicum. (*R. H.* 1907, 328, t.) Primulaceae. H. Very closely allied to *C. persicum*. The leaves have a more open sinus and a cuneate expansion at the base. Peduncle longer. Sepals lanceolate, scarcely imbricate at the base. Corolla white or very slightly rose, red at the throat, very fragrant. Petals narrow, linear-lanceolate, acute. Tunis. (E. Gadeceau, Nantes, France.)

***Cydonia japonica Simonii.** (*G. M.* 1907, 332; *Gard.* 1907, lxxi., May 11, x.) Rosaceae. H. Flowers intense crimson-scarlet. (Lord Aldenham.)

Cymbidium Cravenianum. (*O. R.* 1907, 20.) Orchidaceae. G. A garden hybrid between *C. Lowianum* and *C. Tracyanum*. (J. W. Moore.)

***Cymbidium insigne.** (*R. H.* 1907, 495, f. 166, and col. t.) S. Closely allied to *C. Lowianum*, but much finer. The flowers are large, with the sepals and petals white, suffused and veined with rose, darker outside, the lip densely spotted with crimson, yellow on the disk, and the column deep crimson. Annam. (C. Béranek, Paris.)

***Cymbidium pumilum.** (*K. B.* 1907, 130.) G. Pseudobulbs ovoid, small, 3–5-leaved. Leaves elongate-linear, 6–12 in. long, 3–6 lin. broad. Scape suberect, 4–6 in. long, many-flowered. Sepals oblong, somewhat spreading, about ¾ in. long, light reddish brown. Petals narrowly elliptic-oblong, 7½ lin. long, similar in colour to the sepals. Lip suberect, 3-lobed, 6–7 lin. long, white, with a few red-brown spots on the front lobe, numerous minute lines and dots on the side lobes, and the disk and keels bright yellow. Yunnan, China. (Kew.)

Cymbidium Woodhamsianum. (*O. R.* 1907, 116.) G. A garden hybrid between *C. Lowianum* and *C. eburneo-Lowianum*. (Armstrong & Brown.)

Cypripedium Armstrongiae. (*G. C.* 1907, xlii. 419.) Orchidaceae. S. A garden hybrid between a form of *C. nitens* and *C. Charlesworthii*. (Armstrong & Brown.) [*Paphiopedilum.*]

Cypripedium barbatum bruxellense. (*R. H. B.* 1907, 67.) S. A finely-coloured form. (E. Draps-Dom, Laeken, Belgium.) [*Paphiopedilum.*]

Cypripedium Charlesworthii rubrum. (*G. C.* 1907, xlii. 254.) S. A form with very large and finely coloured flowers. (H. Low & Co.) [*Paphiopedilum.*]

Cypripedium Dicksonianum. (*G. C.* 1907, xli. 161; *G. M.* 1907, p. 178.) S. A garden hybrid between *C. villosum aureum* and *C. Euryades*. (F. Wellesley.) [*Paphiopedilum.*]

Cypripedium Dietrichianum. (*R. H. B.* 1907, 394.) S. A garden hybrid between *C. Stonei* and *C. bellatulum*. (F. Lambeau, Brussels.) [*Paphiopedilum.*]

Cypripedium keighleyense. (*O. R.* 1907, 346.) S. A garden hybrid between a form of *C. nitens* and *C. Arthurianum*. (J. H. Craven.) [*Paphiopedilum.*]

Cypripedium majesticum. (*R. H. B.* 1907. 394.) G. A garden hybrid between *C. Leeanum* and the Harefield Hall variety of *C. insigne*. (J. Hye de Crom, Conpure, Ghent.) [*Paphiopedilum.*]

Cypripedium waltonense. (*G. C.* 1907, xlii. 286; *O. R.* 1907, 351.) S. A garden hybrid probably between *C. Curtisii* and *C. niveum*. (W. Thompson.) [*Paphiopedilum.*]

Cyrtanthus Junodii. (*B. H. B.* 1907, 437, ff.) Amaryllidaceae. G. Bulb ovoid, 4 in. long, 1¾ in. in diam., dark brown. Leaves 4 or 5, ligulate-lanceolate, 1–1¾ feet long, 7½–10 lin. broad, obtuse, arching. Scape erect, round, 10-20 in. long. Umbel 6-9-flowered. Flowers cinnabar, yellow at the apex, pendulous, 1½–1¾ in. long. Transvaal. (W. Barbey, Pierrière, Geneva.)

Cyrtomium falcatum Rochfordii. (*G. C.* 1907, xli. 160; *G.M.* 1907, 163, 165, f.) Filices. G. Differs from the type in having the margins of the pinnae much divided. (T. Rochford & Sons.) [*Aspidium falcatum var.*]

***Cytisus Beani.** (*G. C.* 1907, xli. 313.) Leguminosae. H. A garden hybrid between *C. Ardoini* ♀ and apparently *C. purgans*. It has a prostrate habit and golden-yellow flowers. (Kew.)

***Davallia brasiliensis.** (*G. C.* 1907. xli. 392: *G. M.* 1907, 450, f.) Filices. G. A distinct and elegant species. Fronds 4 ft. long, smooth, deep shining green, with long attenuated pinnules. Brazil. (H. B. May & Sons.)

Delphinium candidum. (*B. M.* t. 8170.) Ranunculaceae. H. H. A dwarf slightly hairy perennial, with usually 3-flowered branches. Leaves palmately 5-lobed, the largest 4–5 in. across, the lowest on stalks 8–15 in. long. Flowers pure white, scented like the primrose, about 2½ in. across, with a slender spur 1½–2 in. long. Uganda. (Lady Hindlip.)

Delphinium macrocentron. (*B. M.* t. 8151.) H. H. or H. A perennial. herb, hairy in nearly all parts. Stems 5 ft. high or more, slightly branched. Leaves stalked, palmately divided; primary segments 3-7, ⅛–1 in. across, 3–many-lobed; lobes acute. Flowers hairy, blue and green or yellow and green, with a whitish apex, about 2 in. long, several together in a raceme: spur broad, straight, erect. Mountains of East Tropical Africa. (J. O'Brien.)

Dendrobium Boundii. (*O. R.* 1907, 104.) Orchidaceae. S. A garden hybrid beween *D. Hildebrandii* and *D. Findlayanum*. (J. Colman.)

Dendrobium chryseum giganteum. (*G. C.* 1907, xli. 290.) A large fine form. (F. Sander & Sons.)

Dendrobium fusiforme. (*G. C.* 1907, xli. 337, f. 142; *O. R.* 1907, 136.) S. Resembles a dwarf slender form of *D. speciosum*, but it differs from that species in having fusiform pseudobulbs seldom more than 1 ft. long, and very slender racemes, 6–10 in. long, of white or yellow flowers, with purple lines on the lip. It was in cultivation in 1885, but was then considered to be a slender form of *D. speciosum*. Queensland. (Sir C. Strickland.)

Deutzia discolor carnea. (*R. H. B.* 1907, 373; *Jard.* 1907, 325; *Gard.* 1907, lxxi. 541.) Saxifragaceae. H. A garden hybrid between *D. scabra* and *D. discolor grandiflora*. (V. Lemoine & Son, Nancy.)

Deutzia discolor lactea. (*R. H. B.* 1907, 373; *Jard.* 1907, 325; *Gard.* 1907, lxxi. 541.) H. A garden hybrid between *D. scabra* and *D. discolor grandiflora*. (V. Lemoine & Son, Nancy.)

***Deutzia gracilis candelabrum.** (*R. H. B.* 1907, 373, f.; *Jard.* 1907. 325, f. 181; *Gard.* 1907. lxxi. 541.) H. A garden hybrid between *D. gracilis* and *D. Sieboldiana*. (V. Lemoine & Son, Nancy.)

Dipelta floribunda. (*G. C.* 1907, xlii. 3, f. 1.) Caprifoliaceae. H. A handsome deciduous shrub allied to *Diervilla*. Leaves opposite, ovate-lanceolate, 3–3½ in. long, 1–1½ in. broad, acuminate, slightly toothed; petioles short. Flowers solitary, axillary, or in few-flowered racemes terminating the short branches formed all along the previous year's growth. Corolla tubular, 1¼ in. long, rose-pink passing to white outside, white with yellow veining inside. Central China. (J. Veitch & Sons.)

Disa equestris. (*G. C.* 1907, xli. 114.) Orchidaceae. G. Basal leaves lanceolate, about 6 in. long. Flowering-stem 1 ft. high, with a few widely separated lanceolate leaves on the lower half, and smaller ones above. Flowers with a pale blue or light voilet funnel-shaped dorsal sepal about 1 in. long, pale violet deflexed lower sepals, and small white petals bearing an elongated reddish spot at the tips. Rhodesia. (Lord Rothschild.)

Diuris longifolia. (*O. R.* 1907, 123.) Orchidaceae. G. A terrestrial plant, 1 ft. high or more. Leaves radical, few, narrow. Flowers yellow and purple, moderately large, several together on a scape. Dorsal sepal broadly ovate; lateral sepals long and narrow. Petals spreading, spathulate. Lip deeply 3-lobed. Western Australia. (J. Wilson Potter.)

***Echeveria cuspidata.** (*M. K.* 1907, 184, f.). Crassulaceae. G. Stemless. Leaves in a dense rosette, bluish-white and very hoary both sides, obovate, about 2½ in. long. Peduncle 8–10 in. long. Flowers in a forked cyme, on pedicels about 5 lin. long. Corolla 5 lin. long, purple inside, with yellowish slightly spreading acute lobes. Mexico. (Darmstadt B. G.) [*Cotyledon.*]

***Echeveria turgida.** (*M. K.* 1907, 148, f.) G. Stemless. Leaves very numerous, in a compact rosette, spathulate-oblong, much swollen, grey-green, spinescent at the apex. Peduncle about 4 in. long, red above, pallid below. Flowers 4–11, in a 1-sided raceme. Corolla 5-angled, rose-coloured, or yellow-red inside and paler outside: lobes acuminate. Mexico. (Washington B. G.: Darmstadt B. G.) [*Cotyledon.*]

Echinocactus brachyanthus. (*M. K.* 1907, 123.) Cactaceae. G. Stem simple, depressed-globose, tubercled and unarmed at the apex. Ribs 22, divided by transverse furrows into 5- or 6-sided tubercles about 1¼ in. long. Areolae narrowly elliptic, shortly woolly. Radial spines 5 or 7, very strong, 5–12 lin. long, yellowish; central usually none. Flowers funnel-shaped, rose-coloured, 2½ in. long. Argentina. (Berlin B. G.)

Echinocactus Fobeanus. (*M. K.* 1907, 187.) G. Stem globose, dark green, depressed at the summit, where it is clothed with a white wool. Ribs 14, twisted. Radial spines 8 or 9, about ½ in. long, black when young; central 1 or 2 or sometimes wanting. Flowers pale yellow. Probably Chili. (Berlin B. G.)

Echinocactus Fricii. (*M. K.* 1907, 174.) G. A new species intermediate between *E. tetracanthus* and *E. Martini*, but it grows to a larger size and differs in its flowers. Argentina. (F. Reichenbach, Dresden.)

***Echinocactus Grossei.** (*B. K.* t. 89; *M. K.* 1907, 56.) G. Stem elongated, about 4 in. high, somewhat depressed above, clothed with white wool. Ribs 17, separated by sharp furrows. Areolae very small. Spines 4 or 5, spreading, up to 1¼ in. long, the lowest the longest. Flowers 2½ in. long, nearly 4 in. across, pale citron-yellow. Paraguay. (Berlin B. G.)

Echinocactus Maassii. (*Gfl.* 1907, 410, f. 50.) G. Stem simple, semiglobose to obovoid, 3–4 in. high or more, 3–4 in. in diam., slightly depressed at the summit where it is covered by bright brown spreading spines. Ribs 13–21, separated by somewhat winding longitudinal furrows, in older plants spirally twisted. Areolae at the summit oval to circular, at first covered with a short white wool, afterwards glabrescent. Radial spines 10–15, 2½–7½ lin. long, at first yellow, afterwards whitish; central 4, in the form of an oblique cross, thickened at the base, the lowermost the longest, often 1¼ in. long. Flowers produced from the areolae at the summit. Bolivia. (Berlin B. G.)

Echinocactus platensis. (*M. K.* 1907, 8, f.) G. Stem cylindric-globose. Ribs 9–14. Areolae elliptic, densely clothed with brown wool, eventually glabrous. Radial spines usually 7, 2½–7½ lin. long; central wanting. Flowers produced near the summit of the stem, 2½–3 in. long; segments snow-white, the outer grey-green on the back, the innermost white-red at the base. Argentina. (Darmstadt B. G.)

***Echinocereus Kunzei.** (*M. K.* 1907, 103.) Cactaceae. G. A tufted plant with glaucous erect cylindric stems up to 10 in. high and 3½ in. in diam. Ribs 13, straight. Radial spines 15–17, subulate, straight, white, 4–5 lin. long; central 1–3, stronger, 5–6 lin. long. Flowers 3¾ in. long, scarlet-crimson; segments narrowly lanceolate to spathulate, ¾–2¼ in. long. Arizona. (Berlin B. G.)

Echinopsis lateritia. (*M. K.* 1907, 128, 151.) Cactaceae. G. Stem simple, ellipsoid, glaucous-green, about 3 in. high, slightly depressed and unarmed at the summit. Ribs 16, subsinuate, somewhat obtuse. Radial spines 8–10, curved, up to 5 lin. long; central 1 or 2, longer: all thickened at the base, shining brown, afterwards canescent. Flowers funnel-shaped, about 2 in. long, scarlet-brickred; tube very short, pilose outside. Bolivia. (Berlin B. G.)

Echinopsis mamillosa. (*M. K.* 1907, 128, 135.) G. Stem simple, depressed-globose, 2½ in. high, 3¼ in. in diam. shining dark green, tubercled and unarmed at the apex. Ribs 17, divided by deep furrows into acute tubercles. Areolae 4–6 lin. apart, irregularly orbicular. Radial spines 8–10, subulate, 2½–5 lin. long: central 1–4, somewhat stronger and longer than the radial, all yellowish, brown at the apex. Flowers about ¾ in. long, white, rose-coloured towards the apex of the segments. Bolivia. (Berlin B. G.)

Echinopsis Meyeri. (*Gn.* 1907, 1, t. 1558.) G. A very distinct new species. Stem globose, somewhat depressed at the summit, pale green, about 4 in. in diam. Ribs 14–16, acute, occasionally somewhat spiral. Spines subulate, 7 or 8 radial and 1 central. Flowers numerous, lateral, club-shaped, 6–8 in. long, 5–10 lin. across. Calyx-tube furnished with brownish green scales from which protrude abundant gray wool. Sepals and petals reduced to peculiar twisted terete threads, the outer brownish, the inner dirty white. Paraguay. (E. Heese, Gr. Lichterfelde, Berlin.)

Enkianthus chinensis. (*G. C.* 1907, xli. 363.) Ericaceae. H. A much branched bush or small tree. Leaves shortly stalked, very variable in shape and size, usually elliptic or obovate-elliptic, narrowed at apex and base, serrulate, glabrous. Flowers in pendulous racemes 2½–3 in. long. Corolla broadly campanulate, yellowish-orange, striped with red. Central and Western China. (J. Veitch & Sons.)

Enkianthus quinqueflorus var. **serrulatus.** (*G. C.* 1907, xli. 344.) H. Differs from the type in its much less coriaceous finely serrulate leaves, more or less villous on the midrib beneath, and in having pure white flowers. Central and Western China. (J. Veitch and Sons.)

Epicattleya balarucensis. (*O. R.* 1907, 90.) Orchidaceae. G. A garden hybrid between *Cattleya labiata* and *Epidendrum eburneum*. (F. Denis, Balaruc les Bains, Herault, France.)

Epidendrum campylostalix. (*G. C.* 1907, xlii. 221.) Orchidaceae. A curious species with glaucous green pseudobulbs and leaves. Flower-spikes decurved. Flowers yellowish, tinged with chocolate colour, whitish on the lip. Central America. (Sir Trevor Lawrence.) [*E. campylostalyx*, Reichb., f.)

Eranthemum Dutremblayanum. (*J. H. F.* 1906, 553.) Acanthaceae. S. A garden hybrid between *E. verbenaceum* and *E. longifolium*. (Dutremblay du May, Courbevoie, Seine, France.)

Eranthemum Magneanum. (*J. H. F.* 1906, 553.) S. A garden hybrid between *E. verbenaceum* and *E. longifolium*. (Dutremblay du May, Courbevoie, Seine, France.)

***Eremostachys superba.** (*G. C.* 1907, xli. 365.) Labiatae. H. Leaves pinnatisect, forming a rosette at the base of the single stem. Stem about 1 ft. high. Flowers deep primrose-yellow, in woolly heads 4–6 in. long and 3–4 in. broad. Western Himalaya. (Kew.)

Eremurus Bungei citrinus. (*R. H.* 1907, 366; *J. H. F.* 1907, 402.) Liliaceae. H. More robust than the type, with larger citron-yellow flowers. It is possibly a hybrid between *E. Bungei* and *E. Olgae*. (Vilmorin-Andrieux & Cie., Paris.)

Eremurus vedrariensis. (*R. H.* 1907, 229, f. 83.) H. A garden hybrid between *E. robustus* and *E. spectabilis*? (Ph. L. de Vilmorin, Verrières, France.)

***Eria longispica.** (*B. M.* t. 8171.) Orchidaceae. S. A new species very nearly allied to *E. latifolia*. It is a vigorous-growing plant with erect habit, broad leaves 12–16 in. long, and long spikes of very numerous small flowers, which are yellow, blotched with reddish-purple. The lip is obicular in outline, not obovate as in *E. latifolia*. Borneo. (Kew.)

***Eria rhyncostyloides.** (*G. C.* 1907, xlii. 370.) S. A handsome new species most nearly allied to *E. convallarioides*, which it resembles in the structure of the flowers, but it is a much larger

plant and more fleshy. Leaves 3 or 4, 12–18 in. long, 2 in. broad, thick, bright green. Inflorescence 8 in. long, consisting of 250–300 flowers about ½ in. across, in a cylindric stalked spike. Flowers white, slightly rose-tinted, the surface with a granulated or frosted appearance. Java. (Hon. W. Rothschild.)

***Erica Veitchii.** (*G. C.* 1905, xxxvii. 138, 228, ff. 97, 100; *Gard.* 1907, lxxi. 101, f.) Ericaceae. H. or H.H. A garden hybrid between *E. arborea* and *E. lusitanica*. (R. Veitch & Sons.)

Ervum gracile. See **Lathyrus filiformis.**

Eryngium proteaeflorum. (*G. C.* 1907, xli. 248, ff. 105, 107.) Umbelliferae. H.H. or H. A spreading bushy herb. Leaves silvery green, linear, 19–24 in. long, ½–1 in. broad, with longitudinal fine white furrows, furnished with spines on both edges about ¾ in. long. Flowering-stems 3 ft. high, much branched. Flower-heads light blue, 2–3 in. long, 1½ in. across, 1 or 2 together, surrounded by a whorl of large silvery white bracts. Mexico. (C. Sprenger, Naples.)

Eupatorium deltoideum. (*B. T. O.* 1907, 13.) Compositae. G. A shrubby evergreen species. Leaves long-stalked, triangular, hastate or sagittate at the base, toothed, green above, pale green beneath, somewhat rugose. Flower-heads large, rosy purple, in terminal panicles. Mexico. (C. Sprenger, Naples.)

Euphorbia cirsioides. (*R. H.* 1907, 492, f. 161.) Euphorbiaceae. S. A shrubby species somewhat resembling a thistle in appearance. Stem much branched, fleshy, smooth, not channelled, bearing numerous wing-like appendages; branches short, terminating in a very sharp spine. Leaves absent. Flowers and fruit unknown. See *B. M. H. N.* 1905, 348. Madagascar. (Paris B. G.)

Euphorbia Intisy. (*R. H.* 1907, 492, f. 160.) S. A small tree 20–23 ft. high. Branches dichotomous or almost whorled, jointed, fleshy. Leaves few, minute. Flowers small, in very short cymes. The plant, known by the native name "Intisy" is interesting as a source of rubber. See *B. M. H. N.* 1900, 257–262, ff. 1–4. Madagascar. (Paris B. G.)

***Fagus sylvatica** var. **fastigiata.** (*G. C.* 1907, xli. 149.) Cupuliferae. H. The Dawyck Beech, remarkable for having erect branches. (F. R. S. Balfour.)

Felicia petiolata. (*G. C.* 1907, xlii. 81, f. 34.) Compositae. H.H. Distinguished from *Agathaea amelloides* by having procumbent or pendulous stems and alternate toothed leaves. Leaves shortly stalked, ovate, ¾–1 in. long. Flower-heads solitary, ¾–1 in. across, on slender peduncles about 2 in. long; ray-florets rosy-purple or mauve; disk-florets yellow. South Africa. (F. Denis, Balarac les Bains, Herault, France.) [Syn. *Aster petiolatus*, Harv.)

***Ferula communis** var. **brevifolia.** (*B. M.* t. 8157; *A. B.* 1907, 375.) Umbelliferae. H.H. Differs from the type in having the ultimate segments of the leaves shorter. This plant is the source of the gum ammoniac of Marocco. Mediterranean Region. (Kew.)

Fraxinus holotricha. (*M. D. G.* 1906, 67; *Späth Cat.* 1907–08, 100.) Oleaceae. H. A new species of the subgenus *Fraxinaster*, remarkable for the copious pubescence on the branches and leaves, and the shortly hispid ovary. A moderately large tree. Buds dark brown. Leaflets 7–13, distinctly stalked, lanceolate or ovate-lanceolate, 1½–3 in. long. Racemes short, with 10 hermaphrodite flowers. Native country unknown. (L. Späth, Berlin; Berlin and Dresden B. G. Cultivated under the name of *F. potamophila*.)

***Fraxinus Spaethiana.** (*Späth Cat.* 1907–08, 101.) H. A beautiful tree with large bright green pinnate leaves. It has been distributed as *F. Sieboldiana*. (L. Späth, Berlin.)

***Glaucium leiocarpum.** (*Jard.* 1907, 29; *B. T. O.* 1907, 215.) Papaveraceae. H. A tufted plant about 1⅓ ft. high. Leaves glaucous. Flowers 2½–3 in. across, deep orange-scarlet, with large black blotches at the base of the petals. Asia Minor. (Haage & Schmidt, Erfurt.)

***Haberlea rhodopensis** var. **virginalis.** (*G. C.* 1907, xli. 322; *G. M.* 1907, 378.) Gesneraceae. H. Flowers pure white. (R. Farrer.)

Haemanthus virescens × albiflos. (*Gfl.* 1907, 493, f. 61.) Amaryllidaceae. G. A garden hybrid. (Freiburg B. G.)

*__Haworthia Pearsoni.__ (*K. B.* 1907, 365.) Liliaceae. G. A stemless plant. Leaves about 80, crowded, spirally arranged, oblanceolate-oblong, 1¼ in. long, about ½ in. broad, pale green, white-striate and furnished with 2 rows of cilia on the back, each with a bristle at the apex about ¼ in. long. Scape 10 in. long. Perianth 7½ lin. long, curved in the lower part; segments oblong, obtuse, pale flesh-coloured, brown-ribbed. South Africa. (Kew.)

Helianthus ciliaris. (*G. C.* 1907, xlii. 342; *R. H.* 1907, 467.) Compositae. H. A pretty floriferous species 16–24 in. high. Stems erect, glabrous, slender, hard. Leaves narrow, undulate, glaucous-green. Flower-heads large, with bright golden-yellow ray-florets and dark brown disk-florets. Mexico. (H. Correvon, Floraire, near Geneva.)

*__Herbertia Amatorum.__ (*K. B.* 1907, 321.) Iridaceae. G. Corm globose, with brown scales. Leaves lanceolate, plicate, acuminate, 8 in. long, 4 lin. broad. Scape 18 in. high, cylindric, very slender, branched. Spathes herbaceous, the outer 1 in. long, the inner almost twice as long. Perianth 2 in. across; outer segments violet, with the midrib white inside, 3 times as long as the inner; claw with a heart-shaped white blotch edged with blue; inner segments violet, brown-spotted at the base. Uruguay. (Kew.)

Hydrangea arborescens var. **grandiflora.** (*G. C.* 1907, xli. 322; *Gard.* 1907, lxxi. 176; *G. M.* 1907, 357, f.; *Jard.* 1907, 340, f. 196.) Saxifragaceae. H. Taller-growing than the type, and all the large pure white flowers are sterile. (Paul & Son; V. Lemoine & Son, Nancy.)

Hoya Engleriana. (*N. B.* iv. 315, t. 2). Asclepiadaceae. S. A new species most nearly allied to *H. linearis*, but it differs in habit and has distinctly smaller leaves. It is an epiphyte, with elongated filiform partly dependent branches. Leaves shortly stalked, lanceolate or narrowly ovate-lanceolate, 7½ lin. long, 2 lin. broad, involute. Flowers fragrant, 4 together in terminal umbels. Corolla whitish, 7½ lin. across, fleshy, deeply 5 lobed. Siam. (Berlin B. G.)

*__Impatiens oppositifolia.__ (*G. C.* 1907, xlii. 102, f. 40.) Geraniaceae. G. A very floriferous species with a free branching habit. Leaves small, opposite, lanceolate. Flowers about 1 in. across, pink to rosy-red or rosy-purple. India and Ceylon. (Kew.)

*__Indigofera hebepetala.__ (*I. S. H. T.* vi. 69, t. 219.) Leguminosae. H. A branched shrub: branches slightly pubescent when young, afterwards glabrescent. Leaves 4–7 in. long, of 9–17 oblong leaflets which are about 2 in. long and ¾ in. broad. Flowers small, reddish, loosely arranged in short axillary racemes. Himalaya. (L. van den Bossche, Tirlemont, Belgium.)

Iris laevigata var. **alba.** (*B. T. C.* 1907, 356) Iridaceae. H. Flowers white with a golden blotch on the larger segments. (C. Sprenger, Naples.)

*__Iris melanosticta.__ (*Gfl.* 1907, 495.) H. A new species of the Apogon group, most nearly allied to *I. Grant-Duffii*, being similar in habit and foliage, but differing in the colour of the flowers. The outer segments are yellow, paler towards the base, where they are dark violet-veined, and bear on the limb 1 or rarely 3 large dark violet blotches. Inner segments pale yellow, somewhat shorter. Syria. (G. Egger, Jaffa.)

Juglans Duclouxiana. (*B. S. D. F.* 1906, 73, 75, 81, ff.) Juglandaceae. H. A new species closely allied to *J. regia*, from which it is easily distinguished by its longer more elliptic more acuminate often cuspidate leaflets, and the nut acute and mucronate at the summit, having a very fragile shell with slightly bony partitions. Yunnan, China. (L. A. Dode, Paris.)

Juglans kamaonia. (*B. S. D. F.* 1906, 73, 75, 86, ff.) H. Leaves with 3–5 pairs of usually lanceolate very pubescent leaflets. Nuts globose with a hard shell sinuous inside, having moderately well developed partly bony partitions. Himalaya. (L. A. Dode, Paris.) [Syn. *J. regia* var. *kamaonia*, C. DC.]

*__Kaempferia lutea.__ (*K. B.* 1907, 60.) Scitamineae. S. A stemless plant. Leaves 3 or 4, oblong, about 9 in. long and 4 in. broad, green and glabrous above, paler and pilose beneath; petiole 2¼ in. long. Scape central, 3½ in. high. Bracts about 8, rounded.

about ¾ in. broad, green. Corolla yellow; tube cylindric, ¾ in. long; lobes oblong, 7½ lin. long; lip orange-yellow, entire, broadly ovate, 1 in. long, ½ in. broad. Penang. (Kew.)

*Kennedya retrorsa. (*B. M.* t. 8144.) Leguminosae. G. A new species characterised by the densely retrorse-pilose pod. A twining shrub, the young growths clothed with reddish hairs. Leaves trifoliolate, stalked, 3–6 in. long; leaflets oval to nearly round, 1–2½ in. long. Raceme including peduncle 2–10 in. long. Flowers rose-purple, with a white spot on the standard, about ⅗ in. across. Eastern Australia. (Kew.)

Laburnum alpinum aureum. (*M. D. G.* 1906, 212.) Leguminosae. H. The leaves are completely and constantly a beautiful golden-yellow. (R. Behnsch, Dürrgoy, Breslau.)

Laelia majalis × tenebrosa. (*J. H. F.* 1906, 616.) Orchidaceae. G. A garden hybrid. (Ét. Bert, Bois-Colombes, Seine, France.)

Laelia Sidneyana. (*G. C.* 1907, xlii. 230.) S. A garden hybrid between *L. cinnabarina* and *L. Jongheana*. (H. A. Tracy.)

Laelia Statherae. (*G. C.* 1907, xli. 226.) S. A garden hybrid between *L. purpurata* and *L. flava*. (D. J. Stather Hunt.)

Laelio-cattleya Duquesnei. (*O. R.* 1907, 92.) Orchidaceae. G. A garden hybrid between *L.-c. warnhamensis* and *Laelia purpurata*. (E. Cappe, Vesinet, France.)

Laelio-cattleya Lawrenceano-callistoglossa. (*R. H.* 1907, 195.) G. A garden hybrid. (A. A. Peeters, Brussels.)

Laelio-cattleya Maurici. (*J. H. F.* 1907, 285.) G. A garden hybrid between *Laelia purpurata* and *Cattleya Trianae*. (L. Duval & Son, Versailles.)

Laelia-cattleya odora. (*J. H. F.* 1906, 777.) S. A garden hybrid between *Cattleya Mendeli* and *Laelia purpurata*. (A. Régnier, Fontenay-sous-Bois, Seine, France.)

Laelia-cattleya stellata. (*O. R.* 1907, 149.) G. A garden hybrid between *Laelia xanthina* and *Cattleya intermedia alba*. (F. Wellesley.)

Laelio-cattleya Veisenpachii. (*O. R.* 1907, 92.) G. A garden hybrid between *L.-c. warnhamensis* and *Cattleya Trianae*. (E. Cappe, Vesinet, France.)

Laelio cattleya Wavrinii. (*O. R.* 1907, 249, f. 29.) G. Supposed to be a natural hybrid between *Cattleya Walkeriana* and *Laelia Boothiana*. (Marquis de Wavrin, Château de Ronsele, Ghent.)

Laelio-cattleya Wolteriae. (*O. R.* 1907, 39, 145, f. 15.) G. A garden hybrid between *Laelia anceps* and *Cattleya Loddigesii*. (P. Wolter, Magdeburg, Germany.)

Lagenaria verrucosa var. Giordaniana. (*B. P.* vi. 142, f.) Cucurbitaceae. G. The species differs from *L. vulgaris* in having globose fruits covered with tubercles. The variety has pear-shaped fruits. Rhodesia. (Palermo B. G.)

Lathyrus filiformis. (*G. C.* 1907, xlii. 48.) Leguminosae. H. A dwarf free-flowering species about 1 ft. high, with a bushy habit. Leaves pinnate, having 2 pairs of narrow leaflets. Flowers large, violet-purple, 8 or more, in racemes. South Europe. (Kew; M. Prichard.) [Syn. *Ervum gracile*; G. C. 1907, xli. 426; J. of H. 1907, lv. 91, f.; not of DC. or Stev.]

Lewisia columbiana. (*G. C.* 1907, xli. 295.) Portulaceae. H. Leaves narrow, fleshy, slightly pubescent, forming a small tuft. Flowers small, red, in panicles. North-western United States. (A. K. Bulley.) [Syn. *Calandrinia columbiana*, Wats.]

*Lewisia Cotyledon. (*G. C.* 1907, xli. 295.) H. Leaves 2 in. long, 1 in. broad, in a rosette, fleshy. Stem fleshy, 4 in. high or more, freely branched. Flowers numerous, rosy, each with 10 petals. Bracts and sepals covered on the margin with reddish gland-tipped hairs. Northern California. (Kew.) [Syn. *Calandrinia Cotyledon*, Wats.]

*Lewisia Leana. (*G. C.* 1907, xli. 295; *G. M.* 1907, 493.) H. Leaves in a tuft, fleshy, terete, 2 in. long, glaucous, evergreen. Flower-stems graceful, much branched, 6–9 in. high. Flowers numerous, small, white streaked with red. Petals 7. Northern California, (A. K. Bulley.) [Syn. *Calandrinia Leana*, Porter.]

***Lewisia pygmaea.** (*G. C.* 1907, xli. 295.) H. A very small species, only 1–2 in. high, with tufts of linear fleshy leaves and numerous small flowers. Rocky Mountains. (A. K. Bulley.) [Syn. *Calandrinia pygmaea*, Gray.]

***Lobelia Richardsonii.** (*G. W.* 1907, 544; *G. C.* 1907, xlii, 76.) Campanulaceae. G. Stems spreading or drooping, 12–16 in. long. Leaves cordate, crisped, small as in the bedding *Lobelia*. Flowers light blue, in a long terminal raceme. (J. Veitch & Sons.) [A garden variety of *Lobelia Erinus*, Linn.]

Lonicera Giraldii. (*R. H.* 1907, 300, f. 98.) Caprifoliaceae. H. A vigorous twining shrub. Leaves shortly stalked, lanceolate, 2–2½ in. long, 7½–9 lin. broad at the base, gradually acuminate, cordate at the base, velvety on both sides. Flowers dull red, scarcely fragrant, about 15 together in heads terminating short branches. Corolla small; tube cylindric, 7½ lin. long; limb 2-lipped; lips reflexed or rolled back, the upper 4 times larger than the lower. Western China. (Ph. L. de Vilmorin, Verrières, France.)

Lonicera retusa. (*Sargent, T. & S.* ii, 49, t. 123.) H. An erect much branched graceful shrub about 6 ft. high. Leaves deciduous, shortly stalked, obovate or broadly ovate, ½–1 in. long, ¼–¾ in. broad, obtuse truncate or emarginate at the apex, dark green above, bluish white beneath. Flowers in pairs, white, becoming yellowish, on short peduncles. Corolla 2-lipped, about ½ in. long. Fruit subglobose, ¼–⅓ in. in diam., shining black. Western China. (J. Veitch & Sons.)

***Lonicera utahensis.** (*Späth Cat.* 1907–08, 107.) H. A finely-branched erect shrub 3–5 ft. high. Leaves oblong, subcordate at the base, 2 in. long, 1 in. broad. Flowers greenish yellow, scarcely ½ in. long. Berries pale scarlet. Utah. (L. Späth, Berlin.)

***Lopezia miniata.** (*R. H. B.* 1907, 157, f. 36.) Onagraceae. G. A slender shrub with a terete glabrous stem and small ovate-oblong serrate leaves. Flowers numerous, small. Sepals spreading. Petals red in the lower part, rose with violet margins in the upper part. Mexico and Guatemala. (V. Heursel-De Meesten.)

Magnolia grandiflora Kathariniana. (*G. C.* 1907, xlii. 390.) Magnoliaceae. H. A form with ascending branches, smaller usually twisted yellowish leaves, smaller petals destitute of a claw and having yellow or light yellow veins. (Acclimatation Garden, Nikita, Walta, Crimea.)

Malus Dawsoniana. (*Sargent, T. & S.* ii. 23, t. 111.) Rosaceae. H. A natural hybrid between *M. fusca* and *M. communis*. Oregon, U.S.A. (Arnold Arboretum.) [*Pyrus.*]

Malus Hartwigi. (*M. D. G.* 1906, 60.) H. A hybrid between *M. baccata* and *M. Halliana*. (K. G. Hartwig, Lübeck.) [*Pyrus.*]

Mammillaria hidalgensis. (*M. K.* 1907, 113, f.) Cactaceae. G. Stem simple, cylindric, up to 1 ft. high or more, rounded at the apex. Tubercles in about 21 rows, remote, conical, obliquely truncate. Areolae floccose-woolly when young, glabrous when old. Radial spines none; central 4, cruciately arranged, sometimes 2, about 5 lin. long, gray or pale brown. Flowers carmine, about ¾ in. long; segments short, narrowly lanceolate, acuminate. Mexico. It has been proposed to distinguish the form with 2 spines as a variety under the name *bispina*. (Darmstadt B. G.)

Mammillaria Knippeliana. (*M. K.* 1907, 59.) G. Stem about 3 in. high and 2½ in across, simple or later becoming branched, sometimes forked, rounded above, slightly depressed at the summit which is sparingly woolly and crowned with white spines blood-red at the tips. Tubercles when young pyramidal, 4-sided, 4 lin. long, about 2½ lin. broad at the base. Areolae circular, at first white-woolly, soon glabrescent. Spines usually 6, up to 1¼ in. long, whitish with blood-red or brown tips, sometimes accompanied with smaller spines. Flowers and native country unknown. (C Knippel, Klein Quenstedt, Germany.)

Mammillaria littoralis. (*M. K.* 1907, 80.) G. A species closely resembling *M. mazatlanensis* and probably not distinct. It is, however, stronger in growth, and its spines are a little longer and of a darker brown colour. California? (Berlin B. G.)

Mammillaria petrophila. (*M. K.* 1907, 55, f.) G. Stem depressed-globose or often cylindric-globose, up to 6 in. high and broad, at first

simple, then branched, with a milky juice. Tubercles about 5 lin. long, broad at the base, obliquely truncate. Areolae oval, of the younger tubercles with a brownish wool, of the older glabrous. Spines chestnut-brown or whitish at the base; radial 8-10, about 10 lin. long; central 1 or rarely 2, twice as long, stouter. Flowers bright greenish gold, 9–10 lin. long. Lower California. (Darmstadt B. G.)

Mammillaria strobiliformis var. **durispina.** (*M. K.* 1907, 87.) G. Differs from the variety *pubescens* in having fewer central spines, which are hard. Mexico. (F. de Laet, Contich, Belgium.)

Mammillaria strobiliformis var. **pubescens.** (*M. K.* 1907, 87.) G. Radial spines 30 or more, hair-like, spreading, interlacing, snow-white; central 5–10, subulate, scarcely separated from the radial, forming an apparent crest at the summit of the stem, soft, coloured like the radial, but fox-red at the tips when young. Mexico. (F. de Laet, Contich, Belgium.)

Mammillaria strobiliformis var. **rufispina.** (*M. K.* 1907, 87.) G. Stem pale green, not gray. Tubercles more lax; furrows glabrous. Radial spines 15–20; central up to 5; all grayish, more or less fox-red at the tips. Flowers brownish. Mexico. (F. de Laet, Contich, Belgium.)

***Mesembryanthemum canum.** (*N. B.* iv. 248.) Ficoideae. G. Stem creeping, dichotomously divided, giving the plant a tufted appearance. Leaves 2–4, opposite, connate at the base, spreading and slightly recurved, nearly ovate, shortly acuminate or obtuse, narrowed towards the base, 1–1⅓ in. long, 5-7½ lin. broad. Flower solitary, with a short club-shaped stalk. Petals yellow, linear, obtuse, in 2 or 3 series. South Africa. (La Mortola.) [First introduced in 1795.]

Mesembryanthemum ramulosum. (*M. K.* 1907, 110.) G. A small tufted plant. Leaves connate in pairs, 3-angled, obtuse, gray-green, ¾ in. long. Peduncle 1¾–2 in. long, with 2 leaf-like bracts at the base. Flowers about 1 in. across. Calyx with 5 equal lobes. Petals in several series, acute, deep yellow. Filaments short. Styles 9. South Africa. (Cambridge B. G.)

Microstylis philippinensis. (*Orch.* ii. 16.) Orchidaceae. S. Leaves broadly oblong, bright green, somewhat undula te on the margin. Spike 8 in. long or more, many (about 100)-flowered. Flowers yellow or purplish. Sepals elliptic or almost orbicular, about 1¼ lin. long. Petals broadly oblong, somewhat shorter than the sepals. Lip orbicular in outline, deeply cordate at the base, 1½ lin. long, 1 lin. broad. Philippine Islands. (Erlangen B. G.)

Miltonia vexillaria Lambeauiana. (*G. C.* 1907, xlii. 117; *J. of H.* 1907, lv. 136.) Orchidaceae. S. Flowers pure white, with lemon-yellow crest. (Jules Hye de Crom, Conpure, Ghent.)

Narcissus Engleheartii. (*Gard.* 1907, lxxi. Nov. 30, vii.) Amaryllidaceae. H. A garden hybrid between a variety of *N. incomparabilis* and *N. poeticus*. (G. H. Engleheart.)

Nepenthes Pauli. (*R. H.* 1907, 9.) Nepenthaceae. S. A garden variety or hybrid of unrecorded parentage. (R. Jarry-Desloges, Paris.)

Nephrolepis exaltata superbissima. (*G. M.* 1907, 844, f.; *J. of H.* 1907, lv. 532, f.; *G. C.* 1907, xlii. 346). Filices. S. A very distinct variety, with cushion-like fronds about 12 in. long and 6 in. broad at the base. The pinnae curve upwards and over one another, some of them being almost at right angles to the plane of the frond. (F. R. Pierson & Co., Tarrytown, New York.) [Syn. *N. superbissima*; Gard. 1907, lxxi. 576, f.]

Nephrolepis exaltata Whitmani. (*G. C.* 1907, xli. 108; *J. of H.* 1907, liv. 238, f.; *R. H. B.* 1907, 159, f. 38, and t.) S. Intermediate between the varieties *elegantissima* and *todeaoides*. Its fronds are less plumose than in the latter, and the lobes of the pinnules are shorter and less acute. (H. B. May; H. Low & Co.). [Syn. *N. Whitmani*; G. M. 1907, 107, f.]

Nopalea guatemalensis. (*S. M. C.* l. 330, tt. 41, 42.) Cactaceae. G. An arborescent plant 15–22 ft. high, closely resembling an *Opuntia*; joints ovate to oblong, 6–8 in. long, blue-green, with numerous very spiny areolae. Spines 5–8, very unequal, the longest 1¼ in. long. Leaves linear, reflexed, acute. Sepals broadly ovate, thickened. Petals reddish (?), scarcely ½ in. long, erect. Guatemala. (Washington B.G.)

Nymphaea Baumii. (*Henk. Nymph.* 60.) Nymphaeaceae. S. The smallest species known. Leaves cordate-orbicular, ¾–1¼ in. across. Flowers ¾–1 in. across, white, slightly fragrant. Petals 7 or 8, lanceolate-elliptic. South West Tropical Africa. (F. Henkel, Darmstadt.)

Nymphaea Casparyi. (*Henk. Nymph.* 66, ff.) S. A new name for a plant in cultivation for many years as *N. gigantea*, but it differs from the true *N. gigantea*, Hook, in having smaller paler flowers, with less deeply cup-shaped petals. The leaves are thin, blue-violet beneath, deeply sinuate-toothed, with much longer teeth. Australia.

Nymphaea Henkeliana. (*Henk. Nymph.* 56, f.) S. Closely allied to *N. stellata*, but it differs in having the leaves sinuate on the margin and in the colour of the small flowers, which are white or pale rose. Probably Eastern India. (F. Henkel, Darmstadt.)

Nymphaea Holtzei. (*Henk. Nymph.* 67, ff.) S. A new species easily distinguished by its strikingly flat flowers. Leaves very thin, oval or almost orbicular, about 10 in. long and 8 in. broad, entire. Flowers pale blue, 4–5 in. across, having an odour of violets. Australia. (F. Henkel, Darmstadt.)

Nymphaea Holtzei var. **Eleonorae.** (Henk. Nymph. 68, f.) S. Flowers pure white. Melville Island, North Australia. (F. Henkel, Darmstadt.) [= *N. Holtzei* var. *albiflora*.]

Nymphaea rubra var. **Krumbiegelii.** (*Henk. Nymph.* 72, f.) S. A large-flowered variety, the flowers being bright red with dark red stamens. The leaves are green above and red beneath. Eastern India. (F. Henkel, Darmstadt.)

Odontioda Bradshawiae. (*G. C.* 1907, xli. 30, 36, f. 21; O. R. 1907, 40, 81, f. 9.) Orchidaceae. G. A garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum crispum*. (Charlesworth & Co.)

Odontioda Devossiana. (*G. C.* 1907, xlii. 318; *G. M.* 1907, 804; *J. of H.* 1907, lv. 423, 529, f.; *O. R.* 1907, 363.) G. A garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum Edwardii*. (H. Graire, Amiens.)

Odontoglossum Aliceae. (*G. C.* 1907, xli. 31, f. 15; *O. R.* 1907, 41, f. 5.) Orchidaceae. G. A garden hybrid between *O. Edwardii* and *O. crispo-Harryanum*. (J. G. Fowler.)

Odontoglossum auriferum. (*O. R.* 1907, 90.) G. A garden hybrid between *O. Hallii-xanthum* and *O. crispum*. (L. Linden & Co., Moortebeek, Brussels.)

Odontoglossum caeruleum. (*G. C.* 1907. xli. 354; *O. R.* 1907, 210, f. 25; *G. M.* 1907, 412, f.) G. A garden hybrid of doubtful parentage, but possibly between a form of *O. ardentissimum* and *O. crispum*. (Ch. Vuylsteke, Loochristi, Ghent.)

Odontoglussum caloglossum. (*G. C.* 1907, xli. 62; *O. R.* 1907, 53.) G. A garden hybrid between *O. crispum* and *O. Vuylstekeae*. (Ch. Vuylsteke, Loochristi, Ghent.)

Odontoglossum Cobbiae. (*O. R.* 1907, 83.) G. A garden hybrid between *O. amabile* and *O. Pescatorei*. (J. G. Fowler.)

Odontoglossum crispum album. (*J. of H.* 1907, liv. 307.) G. Flowers white, with a triangular yellow blotch on the base of the lip. (C. Pauwels, Ghent.)

Odontoglossum crispum callosum. (*R. H. B.* 1907, 203.) G. Flower of a good form and colour. (J. Hye de Crom, Conpure, Ghent.)

Odontoglossum crispum eminatum. (*O. R.* 1907, 27.) G. Sepals and petals broad, white, with dark blotches. (L. Linden & Co., Moortebeek, Brussels.)

Odontoglossum crispum Fowlerianum. (*G. C.* 1907, xli. 277, f. 115.) G. A fine variety distinguished by the clear whiteness of the flowers and the brightness of the ruby-crimson blotches with which the segments are heavily marked. Lip large, crimped at the margin, white, with a yellow crest and purple markings. (J. G. Fowler.)

Odontoglossum crispum heatonense. (*O. R.* 1907, 177.) G. "A particularly heavily blotched flower of fine shape." (Charlesworth & Co.)

Odontoglossum crispum Mossiae. (*G. C.* 1907, xli. 161; *G. M.* 1907, 178; *O. R.* 1907, 115.) G. A fine variety, having flowers with broad fringed segments, silver-white, slightly shaded with rose, the greater part marked with evenly distributed reddish purple blotches. (J. S. Moss.)

Odontoglossum Ernestii. (*O. R.* 1907, 158.) G. A garden hybrid between *O. triumphans* and *O. Adrianae*. (R. G. Thwaites.)

Odontoglossum Galpinianum. (*J. H. F.* 1907, 143.) Orchidaceae. G. A garden hybrid between *O. crispum* var. *guttatum* and *O. loochristiense*. (A. A. Peeters, Brussels.)

Odontoglossum gandavense. (*G. C.* 1907, xli. 353; *O. R.* 1907, 209, f. 23; *G. M.* 1907, 412.) G. A garden hybrid between *O. ardentissimum* and *O. Vuylstekeae*. (Ch. Vuylsteke, Loochristi, Ghent.)

Odontoglossum Kenchii. (*G. C.* 1907, xlii. 3.) G. A garden hybrid between *O. Kegeljani* and *O. Wilckeanum* var. *Mossiae*. (J. S. Moss.)

Odontoglossum Lansberghi. (*R. H. B.* 1907, 19.) G. A garden hybrid between *O. Wilckeanum* and *O. crispum*. (L. Linden & Co., Moortebeek, Brussels.)

Odontoglossum Pescatorei ornatum. (*G. C.* 1907, xlii. 254.) G. A form having large handsome flowers, the lip being densely covered with deep purple blotches. (J. & A. A. McBean.)

Odontoglossum tigrinum. (*O. R.* 1907, 158.) G. A garden hybrid between *O. Harryanum* and *O. Fascinator*. (R. G. Thwaites.)

Odontoglossum Watsonianum. (*R. H. B.* 1907, 20.) G. A garden hybrid between *O. crispum* and *O. Andersoni*. (L. Linden & Co., Moortebeek, Brussels.)

Odontonia Elwoodii. (*G. C.* 1907, xli. 108; *O. R.* 1907, 90.) Orchidaceae. G. A garden hybrid between *Odontoglossum cirrhosum* and *Miltonia Roezlii*. (Charlesworth & Co.)

Oenothera Havardi. (*G. M.* 1907, 317, as *O. Harvardi*.) Onagraceae. H. A small stemless plant covered with a whitish felt. Leaves in a rosette, grass-like. Flowers deep yellow, as large as those of *O. missouriensis*. Nevada and Texas.

Oldenlandia dolichantha. (*B. M.* t. 8165.) Rubiaceae. S. An erect annual herb about 1 ft. high. Stems quadrangular or slightly winged, branched. Leaves sessile, lanceolate, or shortly stalked and linear, 1–2 in. long. Flowers white, more or less green on the under side of the corolla-lobes, fragrant. Corolla with a slender tube about 4 in. long; limb nearly 1 in. across; lobes 4, lanceolate. East Tropical Africa. (Kew.)

Olearia chathamica. (*G. M.* 1907, 724.) Compositae. H.? A sparingly branched robust shrub. Leaves very coriaceous, obvate or oblong-lanceolate, 1–2 in. long, $\frac{1}{3}$–$\frac{2}{3}$ in. broad, acute, serrate; petiole short. Flower-heads few, on slender peduncles. Ray florets white. Disk-florets violet-purple. Chatham Island. (W. E. Gumbleton.) [See *Trans. New Zeal. Inst.* xxiii. 444.]

Olearia speciosa. (*B. M.* t. 8188.) G. A new species allied to *O. dentata*. A straggling shrub about 3 feet high. Branches densely tomentose. Leaves coriaceous, oblong-elliptic, $1\frac{1}{2}$–$2\frac{1}{2}$ in. long, $\frac{3}{4}$–$1\frac{1}{4}$ in. broad, densely tomentose beneath, denticulate. Flower-heads $\frac{2}{3}$ in. long, 1 in. across, in terminal lax corymbs; ray-florets 5 or 6, white, $\frac{1}{2}$ in. long. Australia. (Kew.) [Syn. *O. pannosa*, Hort.]

Oncidium longicornu var. **Grossmanni.** (*Orch.* i. 87.) Orchidaceae. G. Sepals rounded at the apex, pale yellow-green, as well as the petals. Lip only slightly 3-lobed, straw-coloured, with a broad pale brown blotch. South Brazil. (Berlin B. G.)

Onosma Thompsoni. (*J. of H.* 1907, lv. 440.) Boraginaceae. H. or H. H. A very beautiful species having linear-lanceolate leaves covered on the upper side with a white tomentum, and racemes of scarlet flowers borne on much branched stems. [*Echium rubrum*, Jacq.]

Opuntia Gosseliniana. (*M. K.* 1907, 68, f.) Cactaceae. G. A species growing 3 or 4 ft. high, probably allied to *O. albicans*, but flowers and fruit are at present unknown. In the long beautiful bristles with which the stem is provided it resembles *O. missouriensis* var. *trichophora*. Lower California. (Darmstadt B. G.)

Ouratea cuspidata. (*I. S. H. T.* vi. 65, t. 218.) Ochnaceae. S. A shrub 3–6 ft. high, with slender branches. Leaves alternate, shortly stalked, leathery, elliptic, 4–6 in. long. 2½–3¼ in. broad, minutely toothed, acute. Panicles terminal, simple or branched; branches angular. Flowers about ½ in. across, yellow; petals obovate, more or less crisped. Brazil. (L. van den Bossche, Tirlemont, Belgium.) [Syn. *Gomphia cuspidata*, St. Hil.]

Pachypodium Geayi. (*R. H.* 1907, 491, ff. 156, 157.) Apocynaceae. S. A curious tree attaining a height of 30–36 ft., with a succulent spiny *Cactus*-like stem, quite simple or shortly branched only at the summit, and having a terminal tuft of long narrow leaves. Madagascar. (Paris B. G.)

***Paeonia Cambessedesii.** (*B. M.* t. 8161.) Ranunculaceae. H. A herbaceous perennial. Leaves ternately pinnatisect; segments ovate-lanceolate or oblong, acute, entire, deep green above, purple beneath. Flowers solitary, deep rose-pink, about 3½ in. across. Carpels glabrous, purple, shining. Balearic Islands and Corsica. (Glasnevin B. G.)

Passiflora Allardii. (*G. C.* 1907, xlii. 274.) Passifloraceae. G. A garden hybrid between *P. quadrangularis* and *P. coerulea* 'Constance Elliott.' (Cambridge B. G.)

***Patrinia gibbosa.** (*G. C.* 1907, xlii. 197.) Valerianaceae. H. A small plant about 9 in. high, with the leaves swollen or blistered in places, and flat cymes of small yellow flowers. Japan. (S. Arnott.)

Pereskiopsis velutina. (*S. M. C.* l. 333, t. 44.) Cactaceae. G. Stems weak and spreading, forming compact bushes, the old ones with a cherry-brown bark; young branches borne nearly at right angles to the old stem, pubescent and bearing long white hairs, short spines, and bristles. Leaves broadly ovate, ¾–1¾ in. long. Flowers usually sessile on the second year's stems; bud ¾–1¼ in. long. Outer sepals green or deep red tinged with yellow. Petals bright yellow. The genus resembles *Pereskia* in habit and foliage and *Opuntia* in its flowers. Mexico. (Washington B. G.; New York B. G.)

Phaio-calanthe Colmanii. (*G. C.* 1907, xli. 31; *O. R.* 1907, 89, f. 10.) Orchidaceae. S. A garden hybrid between *Phaius* 'Norman' and *Calanthe Regnieri Stevensii.* (J. Coleman.)

Phaius amboinensis. (*O. R.* 1907, 284.) Orchidaceae. S. Resembles *P. flavus* in habit and in the general shape of the flowers, but these are white, with some veining on the lip. Malaya. (F. Sander & Sons.) [Syn. *P. Zollingeri*, Rchb. f.]

Philadelphus magnificus. (*M. D. G.* 1906, 52.) Saxifragaceae. H. A garden hybrid between *P. inodorus* and *P. latifolius.* (L. Späth, Berlin.)

Philadelphus venustus. (*M. D. G.* 1906, 53.) H. Leaves oblong-lanceolate, up to 1¾ in. long, gradually acuminate, subacute at the base, hairy both sides. Flowering-branches short. Raceme 3–5-flowered. Corolla scarcely 1 in. across, with oval petals. Eastern Tibet. (M. L. de Vilmorin, Les Barres, France.)

Phormium tenax Powerscourtii. (*G. W.* 1907, 3, f.) Liliaceae. H. Differs from the type in having narrower and much more rigid leaves; it is also hardier and blooms more freely. (Viscount Powerscourt.) [In cultivation for many years as the Powerscourt variety.]

Phyllocactus Darrahi. (*B. K.* t. 91.) Cactaceae. G. Closely related to *P. anguliger.* The segments of the stem are flat, thin, and broad, very coarsely toothed, and somewhat pale green. Flowers 9 in. long and 4½ in. across, with a fragrance resembling that of the Tuberose; tube greenish, nearly 6 in. long; outer segments yellow and the inner white. Mexico. (Berlin B. G.)

Phyllocactus Purpusii. (*M. K.* 1907, 34, f.) G. A new species allied to *P. grandis.* Plant erect, branched, forming a bush about 3 ft. high; branches large leaf-like, undulate, attenuated and obtuse at the apex. Flowers elongate-funnel-shaped, fragrant, when closed about 11 in. long. Outermost perianth-segments linear-lanceolate, carmine, passing to purple, with a median stripe darker outside and whitish inside; middle segments oblong to lanceolate, carmine-rose to white striped with rose, the inner shortly spinescent; innermost segments oblong, shortly spinescent, white tinted with rose, or yellowish white. Mexico. (Darmstadt B. G.)

Physoptychis gnaphalodes. (*Gard.* 1907, lxxi. 222, as *P. guavalodes.*) Cruciferae. H. A small alpine plant which in general appearance closely resembles an *Aubrietia*, but its foliage is greyer and its flowers are bright citron-yellow. Persia. (M. Leichtlin, Baden - Baden.) [Syn. *Vesicaria gnaphalodes*, Boiss.]

Physosiphon asaroides. (*Orch.* ii. 16.) Orchidaceae. G. Rhizome long, slender. Stems very short or almost none. Leaves triquetous, thick, lanceolate, up to 1¼ in. long, 3–4 lin. thick, usually reddish. Flowers solitary or in pairs, very shortly stalked, green-spotted and suffused with purple outside, dark purple inside. Tube of the sepals 1 in. long. Petals and lip 1–1½ lin. long. South Brazil. (Baron von Fuerstenberg, Schloss Hugenpoet, near Mintard, Germany.)

Picea excelsa interrupta. (*M. D. G.* 1906, 100.) Coniferae. H. A curious form in which the shoots of every second year are abnormally short, and are clothed with short broad almost scale-like leaves which lie close to the branches. Baron von Stauffenberg, Wilflingen, Württemberg.)

Picea excelsa nidiformis. (*M. D. G.* 1906, 87.) H. A form with a cushion-like habit. The short fan-shaped branches are horizontal, and arranged in dense layers, and through the absence of a central shoot the plant assumes a funnel-shaped or nest-like appearance. (R. Grisson, jr., Saselheide, Hamburg.)

Pilocereus Strausii. (*Gfl.* 1907, 410, f. 49.) Cactaceae. G. Stem columnar, up to about 3¼ ft. high, cylindric, crowned with beautiful pure white silky shining soft hairs. Ribs about 25, not prominent. Areolae almost circular, about 2½ lin. apart, covered with a short pure white wool, and each bearing up to 40 white hairs about ¾ in. long, at first soft, afterwards stiffer. The older areolae have 4 reddish white spines, the lowermost of which are longest and about ⅝ in. long. Bolivia. (Berlin B. G.; E. Heese, Gross Lichterfelde, near Berlin.)

Pinus montana aureo-variegata. (*M. D. G.* 1906, 193.) Coniferae. H. A form having some of the leaves golden - yellow. (Fritz Graf von Schwerin, Wendisch - Wilmersdorf, Germany.)

Pinus montana gracilis. (*M. D. G.* 1906, 193, f.) H. A slow- but regular - growing form, with leaves only 1–1¼ in. long. (Fritz Graf von Schwerin, Wendisch - Wilmersdorf, Germany.)

Pinus silvestris crispata. (*M. D. G.* 1906, 192.) H. The long sickle-shaped leaves are each curved in a different direction and stand confusedly together, having a crisped appearance. (F. Graf von Schwerin, Wendisch-Wilmersdorf, Germany.)

Pinus silvestris nivea. (*M. D. G.* 1906, 191.) H. Leaves a dirty white-green. (F. Graf von Schwerin, Wendisch-Wilmersdorf, Germany.)

Pisonia Brunoniana. (*I. S. H. T.* vi. 9, t. 201, as *P. Brunonia.*) Nyctaginaceae. G. A tree reaching a height of nearly 50 ft. Leaves alternate, oval-oblong, up to about 10 in. long and 4 in. broad, acuminate, entire or sinuate; petiole somewhat thick, up to 1 in. long. Flowers very inconspicuous, in spreading terminal cymes. Tahiti and Marquesas Islands. L. van den Bossche, Tirlemont, Belgium.)

Pleurothallis Cogniauxiana. (*Orch.* ii. 28.) Orchidaceae. G. A new species resembling *P. prolifera*, but it is a somewhat taller plant with narrower leaves, and the outside of the flowers are densely hairy. Flowers pallid, densely covered with purple lines and spots. Sepals 4–4½ lin. long. Petals much smaller, cuneate, obtusely angled at the apex. Colombia. (O. Beyrodt, Marienfelde, Berlin.)

Pleurothallis dubia. (*Orch.* ii. 28.) G. A very small creeping plant. Stem 2-edged, 1-leaved. Leaf oblong or elliptic, obtuse, ⅝ in. long, ¼ in. broad; petiole about ½ in. long. Flowers yellow, with a shining orange-yellow lip bearing brown papillae. Sepals oblong, acute, slightly more than ¼ lin. long. Petals lanceolate, much smaller. Lip simple, ovate-oblong. Mexico. (Munich B. G.)

***Podophyllum versipelle.** (*G. C.* 1907, xli. 365; *B. M.* t. 8154.) Berberidaceae. H. A perennial herb with stems nearly 3 ft. high, 2-forked at the top, each fork bearing a lobed peltate leaf 18–20 in. across. Flowers pendulous, deep crimson, about 1 in. long, borne in clusters of from 12 to 16 just under the leaves. Central China. (Kew; J. Veitch & Sons.)

Polycycnis Charlesworthii. (*G. C.* 1907, xlii. 154 ; *O. R.* 1907, 277 : *G. W.* 1907, 612). Orchidaceae. S. Inflorescence long and arching, bearing about 50 flowers, each 1 in. across. Sepals broad, yellowish, closely mottled with pale red-brown, the upper abruptly turned back. Petals linear, twisted, yellow, slightly marked with red at the base. Lip long, narrow, brownish, with whitish hairs. British Guiana ? (Charlesworth & Co.)

Polygonum Auberti. (*R. H.* 1907, 82, ff. 23, 24.) Polygonaceae. H. A vigorous-growing plant with climbing stems reaching a length of 7½–10 ft., becoming woody below. Leaves ovate-lanceolate, cordate at the base, reddish bronze or pale green with the apex red when young. Flowers small, greenish or rosy, in slender axillary panicles 6–8 in. long. The species resembles *P. baldschuanicum*, but is inferior to it. Western China. (Paris B. G.)

***Pouteria suavis.** (*K. B.* 1906, 365 ; *Jard.* 1907, 260.) Sapotaceae. G. A tree with straight somewhat slender flowering branches. Leaves crowded at the ends of the branches, shortly stalked, narrowly oblong to lanceolate, usually about 4 in. long and ½–1 in. broad, coriaceous. Flowers numerous, very small, in fascicles borne in the axils of the fallen leaves. Fruit pear-shaped, 1¾–2 in. long, with a thin edible pericarp possessing a delicate perfume. Uruguay. (Villa Garnier, Bordighera, Italy.)

Primula muscarioides. (*K. B.* 1907, 319 ; *B. M.* t. 8168.) Primulaceae. H. Leaves rather fleshy, obovate-spathulate, 4–5 in. long, crenate-dentate, scarcely stalked. Scape erect, almost twice as long as the leaves. Flowers very numerous, deflexed, in a very dense capitate spike 1–1½ in. long. Corolla narrowly funnel-shaped, scarcely 5 lin. long, deep purple-blue ; lobes about half as long as the tube, subtruncate, almost erect, about 1½ lin. broad. China. (Bees, Ltd.)

Prunus Pissardi Hessei. (*M. D. G.* 1906, 42.) Rosaceae. H. Leaves narrow, irregularly cut and toothed, usually long-acuminate, red, with a broad greenish yellow or sometimes crimson-red border. (Darmstadt B. G.)

Prunus Pissardi Purpusi. (*M. D. G.* 1906, 42.) H. Leaves similar in shape to those of the type, dark red, variegated with yellow and bright rose. (Darmstadt B. G.)

Pterocactus decipiens. (*M. K.* 1907, 145.) Cactaceae. G. A shrubby plant with a subglobose tuber about 2½ in. in diam. Stem cylindric, slightly branched, up to 8 in. high. Areolae orbicular to elongate, woolly. Radial spines 20–25, white, up to 3½ lin. long ; central 2 or 3, pale brown, 2–3½ lin. long. Flowers terminal, about 2 in. long ; segments lanceolate-spathulate, mucronate, yellow. Stigmas 5, purple. Seeds broadly winged. Argentina. (Berlin B. G.)

Pterocactus Kuntzei. (*M. K.* 1907, 137.) G. A small tufted glaucescent shrub. Branches short, slender, somewhat club-shaped. Spines very small, 9–12, adpressed. Flowers terminal, altogether scarcely 1 in. long, and about the same across, yellow. Argentina. (Haage & Schmidt, Erfurt.)

Pteronia incana. (*R. H.* 1907, 151.) Compositae. H. or H. H. A small graceful much branched shrub, covered with a grey tomentum. Leaves in whorls, small, linear-oblong. Flowerheads golden-yellow. South Africa. (J. Navello, La Selva, Nice.)

***Pycnostachys Dawei.** (*G. C.* 1907, xli. 18.) Labiatae. G. A stout herb 4–6 ft. high, with a loosely-branched pyramidal habit. Leaves narrowly lanceolate, 5–12 in. long, ½–1½ in. broad, acuminate, serrate. Flowers many, crowded, in short spikes terminating all the branches. Calyx-teeth needle-like, ciliate with long hairs. Corolla about ⅔ in. long, cobalt-blue. Uganda. (Kew.)

Rhipsalis pilocarpa. (*M. K.* 1907, 182 ; *B. K.* t. 99.) Cactaceae. S. Branches terete, thickly covered with areolae, each of which bears a bundle of 10–15 white bristles up to 2½ lin. long. Flowers terminal, wheel-shaped, 1 in. across. Petals lanceolate, 20–25, acute, pale yellow, becoming slightly green, the outer suffused with a delicate rose at the apex. Brazil. (Berlin B. G.)

Rhipsalis Simmleri. (*B. H. B.* 1907, 136, ff.) S. Stem slender, cylindric, more or less pendulous, very much branched ; branches dichotomous or in whorls of 3 or 4, ½–1¼ in. long, 5-angled or somewhat ribbed. Flowers solitary, almost terminal. Petals white, red at the apex, the outer scale-like and very small, the inner oblong-spathulate, ¼–⅓ in. long. Costa Rica. (W. Barbey, Pierrière, Geneva.)

Rhododendron Benthamianum. (*K. B.* 1907, 319.) Ericaceae. H. A new species resembling *R. yunnanense*, from which it differs in the more densely lepidote leaves and in having purple-violet flowers, which are usually in threes, and about 2½ in. across. Western China. (J. Veitch & Sons.)

Rhododendron chartophyllum. (*R. H.* 1907, 248 ; *J. H. F.* 1907, 197.) G. Allied to *R. yunnanense*, but the leaves are narrower and are not ciliate. Flowers numerous, broadly funnel-shaped, 1¼-1¾ in. long, violet-rose or white. South China. (M. L. de Vilmorin, Les Barres, France.

***Rhododendron intricatum.** (*G. C.* 1907, xli. 262, f. 111 ; *B. M.* t. 8163.) H. A densely branched shrub 1–3 ft. high, flowering when only a few inches high. Leaves persistent, crowded, small (½ in. long or less), oblong, densely clothed with small peltate scales on both sides. Flowers usually in clusters of 5, lilac or almost violet in colour. Stamens included, the yellow anthers just protruding from the tube of the corolla. Western China. (J. Veitch & Sons.) [This is the plant referred to in *G. C.* 1907, xli. 225, and in *J. of H.* 1907, liv. 343, under the erroneous name of *R. nigro-punctatum.*]

***Rhododendron Kaempferi.** (*Sargent, T. & S.* ii. 29, t. 113.) H. Differs from typical *R. indicum* (*Azalea indica*) in having deciduous elliptic sometimes nearly rhombic or elliptic-ovate leaves, smaller flowers in 2–4-flowered umbels, and only 5 (not 5–10) stamens with yellow instead of purple anthers. First introduced into America in 1892. Japan. (Arnold Arboretum.) [Syn. *R. indicum* var. *Kaempferi*, Maxim. ; *R. Sieboldi*, Miq., &c.]

***Rhododendron Mariesii.** (*K. B.* 1907, 244.) H. H. or H. A new species of the section *Azalea*. A bush 3–7 ft. high. Leaves clustered, deciduous, membranous, ovate, 2½–3 in. long, 1–1⅓ in. broad, acute, hairy when young ; petiole 2–4 lin. long. Buds ovoid ; scales broadly ovate or orbicular. Flowers usually in pairs, rarely solitary, pale purple, 1¾–2 in. across. Calyx annular, densely setose. Corolla deeply 5-lobed. Central China. (Kew.)

Rhus typhina filicina. (*B. T. O.* 1907, 248.) Anacardiaceae. H. The leaves of this variety are about 3 ft. long, with 23 pairs of leaflets, which are more or less deeply incised. (C. Sprenger, Naples.)

***Rhus typhina laciniata.** (*R. H.* 1907, 10, ff. 1, 2.) H. The leaves have 6–10 pairs of very much laciniated leaflets. (Barbier & Co., Orleans.)

Rhynchanthus Johnianus. (*Gfl.* 1907, 113, t. 1560.) Scitamineae. S. Stem about 5 ft. high. Leaves in 2 rows, lanceolate, acuminate, 8–10 in. long, 1¾–2½ in. broad. Inflorescence elongated, many-flowered. Bracts red, lanceolate, acuminate. Corolla yellow, slightly longer than the bracts, divided to below the middle into 3 narrow acuminate segments. Moulmein. (K. W. John, Andernach on the Rhine, Germany.)

***Ribes mogollonicum.** (*B. M.* t. 8120.) Saxifragaceae. H. A robust shrub with a habit resembling that of *R. sanguineum*. Leaves suborbicular, usually 5-lobed, 1–3 in. across. Flowers small greenish white, in straight erect or suberect dense racemes. Berries ovoid-globose, purplish or bluish-black, about ⅓ in. across, edible. South-western United States. (Kew.)

***Rindera umbellata.** (*G. C.* 1907, xlii. 226, ff. 97, 98.) Boraginacea. H. Stem erect, 1–2 ft. high. Basal leaves tufted, evergreen, oblong-lanceolate to ovate-lanceolate, long-stalked ; cauline leaves lanceolate, with a winged petiole or sessile, all entire, grey-pubescent. Flowers in scorpioid cymes umbellately arranged. Calyx densely woolly, 5-partite. Corolla tubular, scarcely ½ in. long, reddish yellow or dark brown ; lobes erect, oblong. Nutlets ovate - orbicular, broadly winged. Hungary ; Servia. (T. Smith.) [Syn. *Cynoglossum umbellatum*, Waldst. & Kit. ; *Mattia umbellata*, Schultes.]

Rosa Willmottiae. (*K. B.* 1907, 317.) H. A new species allied to *R. Webbiana*. A densely branched shrub 5–10 ft. high, except the glandular-ciliate stipules almost quite glabrous. Branches brown-red. Spines on the flowering branches in pairs, straight, 4–5 lin. long, pallid. Leaves crowded, ¾–1¼ in. long ; stipules minute, free above the middle. Flowers rose-lilac or rose-purple, 1½–1¾ in. across, solitary at the ends of the shorter branches. Sepals lanceolate, entire, about 5 lin. long. Petals almost entire. Styles free. China. (J. Veitch & Sons.)

Rubus flagelliflorus. (*Veitch Nov.* 1907, 7, f.; *Gard.* 1907, lxxi, 237, as *R. flagelliformis.*) Rosaceae. H. Almost evergreen, and remarkable for the metallic appearance of the leaves during the summer. The young shoots and the under surface of the cordate acuminate leaves are covered with a thick dun-coloured tomentum. Flowers white, borne on growths 6–8 ft. long. Central China. (J. Veitch & Sons.)

***Salvia cyanea.** (*Jard.* 1907, 146.) Labiatae. G. Stems quadrangular, slightly winged. Leaves obovate, toothed, glabrous, beautiful bright green; petiole rather long. Flowers small, sky-blue. in long terminal panicles. A winter-flowering species. Central America.

Salvia princeps. (*R. H. B.* 1907, 257, f. 52 & col. t.) A shrubby winter-flowering species resembling *S. splendens.* The plant attains a height of 5–7 ft. Leaves large, ovate, serrate, with the principal veins prominent. Flowers a brilliant crimson-rose, in large spikes terminating the branches. Corolla much longer than the calyx, slightly ventricose; lips small. Mexico. (Besson frères, Nice.)

***Salvia Souliei.** (*Veitch Nov.* 1907, 11, f.; *Gard.* 1907, lxxi. 237.) H. A handsome perennial herb, 2 ft. high. Leaves dark green, rugose, triangular. Flower-stems 2 ft. high. Flowers numerous, tubular, of a delicate shade of blue. Western China. (J. Veitch & Sons.)

***Saxifraga Aizoon lutea.** (*G. C.* 1907, xlii. 28.) Saxifragaceae. H. Flowers at first primrose-yellow changing to a creamy-yellow.

***Saxifraga Aizoon rosea.** (*G. C.* 1907, xli. 358, 418; *Gard.* 1907, lxxi. 292; *G. M.* 1907, 412, 493.) H. Differs from the type in having bright pink flowers. (R. Farrer; S. Arnott.)

***Saxifraga Brunoniana.** (*G. C.* 1907, xlii. 48.) H. Remarkable for its numerous crimson thread-like stolons. Leaves narrow, in rosettes, similar to those of *S. aizoides.* Flowers yellow. Himalaya. (Kew.)

***Saxifraga gemmipara.** (*G. C.* 1907, xlii. 292.) H. H. Similar to the species included in the section to which *S. aizoides* belongs. It is of tufted habit, only 1 or 2 in. high. Leaves ½–¾ in. long, ¼ in. broad, densely covered with long hairs. Flowers white, about ½ in. across, with prominent orange-coloured stamens. Yunnan, China. (Bees, Ltd.)

***Saxifraga tellimoides.** (*J. H. F.* 1907, 402; *B. S. B. F.* 1904, *Append.* 128.) H. Leaves long-stalked, almost peltate, deeply lobed. Flowers white or yellowish, rather large, in a pedunculate cyme. Japan. (Ph. L. de Vilmorin, Verrières, France.)

Solanum texanum tricolor. (*O. G. Z.* 1907, 65, f. 11.) Solanaceae. G. Fruits changing in colour from white to an intense yellow, then to a bright scarlet-red. (M. Herb, Naples.)

Sophro-cattleya Heathii. (*O. R.* 1907, 91.) Orchidaceae. G. A garden hybrid between *Sophronitis grandiflora* and *Cattleya Schroederae.* (Heath & Sons.)

Sorbus maderensis. (*B. S. D. F.* 1907, 206, f.) Rosaceae. H. Very similar to *S.* (*Pyrus*) *Aucuparia*, but the leaves are smaller. with sessile leaflets rounded at the apex and glabrescent in the adult stage. Inflorescence much more compact. Madeira. (L. A. Dode, Paris.) [Syn. *S. Aucuparia*, Linn., var. *maderensis*, Lowe.] [*Pyrus.*]

Sorbus reflexipetala. (*M. D. G.* 1906, 58.) H. Younger branches sparingly pilose at the apex. Buds somewhat viscous. Rhachis of the leaf at first sparingly pilose, afterwards glabrous; leaflets 11–17, mostly oblong lanceolate, 1¼–2 in. long, very acute or shortly acuminate, coarsely toothed, almost glabrous. Corymb glabrous. Corolla 2½–3 lin. across. Petals reflexed. Probably Japan. (L. Späth, Berlin.) [*Pyrus.*]

Sorbus serotina. (*M. D. G.* 1906, 59.) H. Younger branches quite glabrous. Buds somewhat viscous. Rhachis of the leaf at first covered with long ferruginous hairs, afterwards glabrous; leaflets 9–13, oblong-lanceolate or oblong, long-acuminate, 1½–2 in. long, toothed. Corymb densely pilose. Corolla 2½–3 lin. across. Petals reflexed. Probably Japan. (L. Späth, Berlin.) [*Pyrus.*]

Spiraea Aruncus var. **plumosa.** (*G. C.* 1907, xlii. 244.) Rosaceae. H. Much dwarfer than the type. Stems and leaf-stalks reddish. Leaves pale nut-green, the lobes minutely serrulate. Flowers white, in an elegant panicle 2 ft. long.

Spiraea gigantea rosea. (*Gard.* 1907, lxxi. 418, f.) H. The plant grows 6 ft. high or more, and has very large leaves and large spreading heads of bright rose flowers. (A. Perry.) [Syn. *S. camtschatica rosea*; *G. C.* 1907, xlii. 76; *G. M.* 1907, 568; *G. W.* 1907, 545.]

Stauropsis luchuensis. (*K. B.* 1907, 131.) Orchidaceae. G. A scandent herb with stems 1 ft. long. Leaves distichous, oblong, very shortly 2-lobed, 4–6 in. long, ¾–1¼ in. broad. Scapes suberect, 6–16 in. long. Raceme many-flowered. Flowers showy, yellow, with brown spots. Sepals obovate-oblong. 6–8 lin. long. Petals somewhat narrower than the sepals. Lip fleshy, slightly 3-lobed. 7½ lin. long, saccate at the base. Luchu Archipelago. (Cultivated in Japan.)

Streptocarpus Junodii. (*B. H. B.* 1907, 699, 1013, ff.) Gesneraceae. G. Stemless. Leaves 4–6, rugose, usually narrowed at the base, villose, with the veins on the underside thick, prominent, and densely villose. Peduncles erect, 3–5 in. high, 3–6-flowered. Flowers pendulous, 1¾–2 in. long, blue-lilac, with the median lower lobe of the corolla-limb marked at the base with a linear citron-yellow blotch. Transvaal. (W. Barbey, Pierrière, Geneva.)

Strobilanthes Micholitzi. (*G C.* 1907, xli. 246.) Acanthaceae. S. A half-shrubby plant 3–4 ft. high. Stem 4-angled, dilated at the nodes. Leaves lanceolate or ovate-lanceolate, 6 in. long, 2 in. broad, one much larger than the other, acuminate at both ends; petiole 1 in. long; racemes axillary, very numerous, cone-like, ½–¾ in. long; bracts rounded, white tipped with green. Flowers white, shortly projecting from the cone. Sumatra. (F. Sander & Sons.)

***Tamarix pentandra.** (*B. M.* t. 8138.) Tamaricaceae. H. A very decorative species differing from *T. gallica* in the persistent connivent petals and in the filaments, which are not wider at the base, arising between the lobes of the disk. South-Eastern Europe and the Orient. (Kew.) [Syn. *T. Pallasii*, Desv.]

Tellima affinis. (*Jard.* 1907, 28, f. 18.) Saxifragaceae. H. H. A tuberous-rooted plant with long rigid stems, lobed bright green leaves and small graceful white flowers. California. (Ph. Rivoire, Lyons, France.)

***Thalictrum dipterocarpum.** (*Veitch Nov.* 1907, 9, f.; *Gard.* 1907, lxxi. 237.) Ranunculaceae. H. A robust species with an elegant habit and prettily divided leaves. Flowering-stems 4–5 ft. high. Flowers rose-purple, with yellow anthers. Western China. (J. Veitch & Sons.)

Thuyopsis dolabrata altissima. (*M. D. G.* 1906, 145.) Coniferae. H. Vigorous, with an almost columnar habit; branches short and heavy, hanging over prettily. (C. Ansorge, Klein Flottbek, Hamburg.)

Thuyopsis dolabrata cristata. (*M. D. G.* 1906, 145.) H. The plant is depressed-globose, with compact broadly fan-shaped ascending branches, which are very full and somewhat crisped. (C. Ansorge, Klein Flottbek, Hamburg.)

Thuyopsis dolabrata plicata. (*M. D. G.* 1906, 145.) H. Very vigorous, with heavy branches which hang over and appear folded. (C. Ansorge, Klein Flottbek, Hamburg.)

***Tiarella unifoliata.** (*G. M.* 1907, 452.) Saxifragaceae. H. More robust than *T. cordifolia*, sometimes attaining a height of 3 ft. Flowers rose-tinted, in pretty spikes. North-West America. (Craven Nursery Co.; S. Arnott.)

***Tricholepis furcata.** (*I. S. H. T.* vi. 23, t. 207.) Compositae. H. or H. H. A glabrous or puberulous herb. Stem 1¾–5½ ft. high, branched from the base. Leaves shortly stalked, elliptic-lanceolate, 2–6 in. long, ¾–2½ in. broad, acute or acuminate, denticulate. Flower-heads rather large, yellow, solitary at the ends of the branches, with needle-like involucral bracts. Himalaya. (Kew; L. van den Bossche, Tirlemont, Belgium.) [Syn. *Carduus trichocephalus*, Wall.]

***Tricuspidaria dependens.** (*B. M.* t. 8115.) Tiliaceae. G. A small compact tree. Leaves obovate or elliptic or sometimes ovate, ¾–2½ in. long, ½–1¼ in. broad, serrate. Flowers 1–3 together, axillary, borne on long curved peduncles. Petals oblong, white, about ¾ in. long, 3-toothed at the apex. This is the true *T. dependens*, Ruiz & Pav. The plant under this name in *Bot. Mag.* t. 7160, is *T. lanceolata*, Miq. Central Chili. (Kew.)

Tritoma rufa var. **venusta.** (*R. H.* 1907, 304, t.) Liliaceae. H. Scape long and very straight. Flowers a beautiful bright yellow. (Ph. L. de Vilmorin, Verrières, France.) [*Kniphofia rufa* var.]

***Trollius chinensis.** (*G. W.* 1907, 283, f.) Ranunculaceae. H. Plant about 2 ft. high, with leaves similar to those of the other species in cultivation. Flowers flat (not globular), the golden-yellow sepals spreading horizontally. Petals long and narrow, standing up conspicuously in the centre of the flower. China. (Kew.)

Ulmus japonica. (*Sargent, T. & S.*, ii. 1, t. 101.) Urticaceae. H. A new species resembling *U. americana* in habit, foliage, and pubescence. A tree 65–90 ft. high, with a trunk often 3–4 ft. in diam. Branches gracefully pendent, with slender slightly zigzag branchlets, pale yellow-green during their first season, becoming deeper coloured. Winter-buds obtusely conical. Leaves oblong-obovate, 3–6 in. long, 1½–3 in. broad, unequal at the base, coarsely toothed. Flowers nearly sessile, light red. Fruit narrowly oblong-obovate. Japan. (Arnold Arboretum.)

Vernonia gigantea. (*R. H.* 1907, 468.) Compositae. H. A robust plant with very large panicles of carmine or violet-rose flower-heads. (H. Correvon, Floraire, Geneva.)

Viburnum cinnamomifolium. (*Sargent, T. & S.* ii. 31, t. 114.) Caprifoliaceae. H. A glabrous shrub or small tree with dark reddish brown branches. Leaves leathery, persistent, elliptic-oblong, 3–5 in. long, 1¼–2 in. broad, long-acuminate, entire or with a few small teeth near the apex, conspicuously 3-nerved; petioles stout, ½–1 in. long. Flowers small, greenish white, in large loose umbel-like corymbs. Mt. Omei, Western China. (J. Veitch & Sons.)

Viburnum propinquum. (*Sargent, T. & S.* ii. 33, t. 115.) H. A shrub with reddish brown lustrous branches. Leaves handsome, evergreen, elliptic to elliptic-oblong or ovate to ovate-lanceolate, 1¾–4 in. long, ⅔–1½ in. broad, remotely toothed, glabrous, conspicuously 3-nerved, with slender petioles up to ⅔ in. long. Flowers small, greenish white, in small umbel-like terminal corymbs. Central and Western China. (J. Veitch & Sons.)

***Viburnum utile.** (*G. C.* 1907, xli. 381.) H. An extremely floriferous species. Stems stellate-tomentose when young, glabrous when mature. Leaves shortly stalked, thick, lanceolate-oblong or ovate-lanceolate, 1–1½ in. long, ¾–1 in. broad, obtuse, entire. Flowers pure white, ⅓ in. across, in dense corymbose cymes about 3 in. across. Central China. (J. Veitch & Sons.)

Victoria Cruciana var. **Malmei.** (*Henk. Nymph.* 43.) Nymphaeaceae. S. A very robust variety. The strong ribs of the margin of the leaf, which is strikingly ventricose, are pale rose to dark rose, with the intermediate tissue green. Brazil. (Stockholm B. G.; F. Henkel, Darmstadt.) [*V. regia*, Lindl. var.]

Vitex littoralis. (*B. P.* vi. 86, t. 2.) Verbenaceae. G. A tree 18 ft. high or more, with a hard durable wood. Leaves dark green, long-stalked, the lower with 3, the upper with 5 leaflets which are elliptic, obtusely acuminate and glabrous. Flowers in a short racemose panicle. Corolla bright rose, about 1 in. long, 2-lipped. New Zealand. (Palermo B. G.)

***Vitis Pagnucci.** (*G. M.* 1907, 797.) Ampelidaceae. H. A slender-growing densely branched plant. Leaves small, few-lobed, bronze-coloured in autumn. China. (Kew.)

***Vitis semicordata.** (*G. M.* 1907, 797, as *V. semicaudata*.) H. A self-clinging species. Leaves long-stalked, 3-lobed, dark green above, paler reddish and pubescent beneath; leaflets ovate, with a slender tapering apex. Himalaya and Khasia Mts. [= *V. himalayana*, Brand., var. *semicordata*, Wall.]

Woodwardia paradoxa. (*G. C.* 1907, xli. 98.) Filices. G. A new species resembling *W. radicans*, but it has narrower fronds, and the veinlets are perfectly free from the sorus to the margin. The fronds are 3 ft. long and 9 in. broad in the middle, quite glabrous and destitute of scales; pinnae lanceolate, about 6 in. long and 1½ in. broad. Small island near Vancouver Island. (Glasnevin B. G.)

Zaluzianskia maritima. (*G. C.* 1907, xlii. 161, f. 64.) Scrophulariaceae. G. A viscid herb somewhat shrubby at the base. Stem up to about 15 in. high, leafy. Leaves linear to oblong, sessile, entire or few-toothed. Flowers in the axils of the uppermost leaves. Corolla with a slender reddish or purplish tube 1–1½ in. long; lobes of the limb bifid, reddish or purplish outside, white inside; they expand at night or in imperfect light. South Africa. (W. E. Gumbleton.) [Not the true *Zaluzianskya maritima*. Walp., but *Z. lychnidea*, Walp.]

Zephyranthes candida var. **major.** (*Gard.* 1907, lxxi. 515.) Amaryllidaceae. H. Flowers 4 in. long, borne on long stout stems Uruguay. (Kew.)

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX IV.—1908.

LIST of STAFFS of the ROYAL BOTANIC GARDENS, Kew, and of Botanical Departments, Establishments and Officers at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Botanic Gardens, Kew.—

Director - - - - -	Lieut.-Col. D. Prain, I.M.S., C.I.E., M.A., M.B., LL.D., F.R.S., F.L.S.
Assistant Director - - -	Arthur W. Hill, M.A., F.L.S.
Assistant (Office) - - -	*John Aikman.
,, ,, - - -	*William Nicholls Winn.

Keeper of Herbarium and Library	*William Botting Hemsley, F.R.S., F.L.S.
Principal Assistant (Phanerogams)	Otto Stapf, Ph.D., F.R.S., F.L.S.
,, ,, (Cryptogams) -	George Massee, F.L.S.
Assistant (Herbarium) - -	Nicholas Edward Brown, A.L.S.
,, ,, - -	*Robert Allen Rolfe, A.L.S.
,, ,, - -	Charles Henry Wright, A.L.S.
,, ,, - -	*Sidney Alfred Skan.
,, ,, - -	Thomas Archibald Sprague, B.Sc., F.L.S.
,, ,, - -	Arthur Disbrowe Cotton, F.L.S.
,, for India - - -	*John Hutchinson.

Assistant (Jodrell Laboratory) - Leonard Alfred Boodle, F.L.S.

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Royal Botanic Gardens, Kew—*continued.*

Keeper of Museums - - -	John Masters Hillier.
Assistant (Museums) - - -	*John H. Holland, F.L.S.
Preparer - - - - -	George Badderly.

Curator of the Gardens - -	William Watson, A.L.S.
Assistant Curator - - -	*William J. Bean.
Foremen :—	
Herbaceous Department - -	*Walter Irving.
Arboretum - - - -	*William Dallimore.
Greenhouse and Ornamental Department.	*Arthur Osborn.
Tropical Department - -	*Charles P. Raffill.
Temperate House - - -	*William Taylor.
Storekeeper - - - -	*George Dear.

Cambridge.—University Botanical Department :—

Professor - - - -	A. C. Seward, M.A., F.R.S., F.L.S.
Curator, University Herbarium.	C. E. Moss, D.Sc.
Curator, University Museum.	E. R. Burdon, M.A., F.L.S.
Curator of Garden -	*Richard Irwin Lynch, M.A., A.L.S.

Dublin.—Royal Botanic Gardens, Glasnevin :—

Keeper - - - -	Frederick W. Moore, A.L.S.
Assistant - - - -	*C. F. Ball.

Trinity College Botanic Gardens :—

Professor - - - -	H. H. Dixon, Sc.D., F.R.S.

Edinburgh.—Royal Botanic Garden :—

Regius Keeper - -	Isaac Bayley Balfour, M.D., Sc.D., F.R.S., F.L.S.
Assistant (Museum) -	H. F. Tagg, F.L.S.
,, (Herbarium)	*J. F. Jeffrey.
Head Gardener - -	*R. L. Harrow.
Assistant Gardener -	Henry Hastings.

Glasgow.—Botanic Gardens :—

University Professor -	F. O. Bower, M.A., Sc.D., F.R.S., F.L.S.
Curator - - - -	James Whitton.

Liverpool.—University Botanical Department :—

	Professor - - -	R. J. Harvey Gibson, M.A., F.L.S.

Oxford.—University Botanic Garden :—

	Professor - - -	SydneyH.Vines,M.A., Sc.D., F.R.S., F.L.S.
	Curator - - -	*William Baker.

AFRICA.

British East Africa Protectorate.—

Nairobi -	Director of Agriculture.	A. C. Macdonald.
	Assistant - - -	*Henry Powell.
	Conservator of Forests	D. E. Hutchins.

Cape Colony.—

Cape Town -	Hon. Curator, Government Herbarium.	Prof. Pearson, M.A., F.L.S.
	Conservator of Forests	J. S. Lister.

Gardens and Public Parks :—

Superintendent - -	H. J. Chalwin.

Grahamstown.—Albany Museum :—

	Director - - -	S. Schönland, Ph.D., F.L.S.

Gardens and Public Parks :—

	Curator - - -	Edwin Tidmarsh.
Port Elizabeth -	Superintendent - -	John T. Butters.
King Williamstown.	Curator - - -	George Lockie.
Graaff-Reinet -	„ - - -	*C. J. Howlett.
Uitenhage -	„ - - -	H. Fairey.

Egypt.—

Cairo.—Khedivial Agricultural Society :—

Secretary - - -	G. P. Foaden, B.Sc.

Gold Coast.—Botanic and Agricultural Department :—

Director of Agriculture.	——
Travelling Instructor	*Alfred E. Evans.

Gold Coast.—Botanic and Agricultural Department—*continued.*

Curator	- - -	*James Anderson.
,,	- - -	*K. G. Burbridge.
,,	- - -	A. F. Gear.
,,	- - -	F. De Valda.
,,	- - -	*Robert Band.

Natal.—Botanic Gardens :—

Durban - -	Director - - -	John Medley Wood, A.L.S.
	Curator - - -	*James Wylie.

Northern Nigeria.—

Conservator of Forests ——

Nyasaland Protectorate.—

Forestry and Botanical Department :—

Zomba - -	Head of Department -	*J. M. Purves.
	Forester - - -	*E. W. Davy.

Orange River Colony.—Department of Agriculture :—

Chief of Forestry Division. K. A. Carlson.

Rhodesia.—

Bulawayo.—Rhodes Matopo Park :—

Curator - - - W. E. Dowsett.

Salisbury.—Department of Agriculture :—

Director - - -	Dr. A. E. Nobbs.
Assistant - - -	*C. E. F. Allen.

Sierra Leone.—Botanic Station :—

Agricultural Superintendent - - - *C. W. Smythe.

Soudan.—

Khartoum -	Director of Woods and Forests.	A. F. Broun.
	Superintendent of Palace Gardens.	*F. S. Sillitoe.
Jebelin - -	Superintendent of Experimental Plantations.	*T. Cartwright.

Southern Nigeria.—Agricultural Department :—

Curator	- - -	*William Don.
,,	- - -	*H. Dodd.
,,	- - -	*J. L. Williams.
,,	- - -	*A. Hislop.
Assistant	- - -	*T. B. Dawodu.
Conservator of Forests	- -	H. N. Thompson.

Transvaal.—Department of Agriculture :—

Pretoria - -	Botanist - - -	J. Burtt Davy, F.L.S.
	Mycologist - - -	†I. B. Pole Evans, B.Sc., F.L.S.

Uganda.—Scientific and Forestry Department :—

Entebbe - -	Director - - -	*M. T. Dawe, F.L.S.
	Assistant - - -	*Robert Fyffe.
Zanzibar - -	Director of Agriculture	R. N. Lyne, F.L.S.

Dunga Experimental Station :—

	Superintendent -	W. Buzzacott.

AUSTRALIA.

New South Wales.—Botanic Gardens :—

Sydney - -	Director and Government Botanist.	J. H. Maiden, F.L.S.
	Superintendent -	George Harwood.
	Botanical Assistant -	E. Betche.

Technological Museum :—

	Curator - - -	R. T. Baker, F.L.S.

Queensland.—

Brisbane - -	Colonial Botanist -	F. M. Bailey, F.L.S.

Botanic Gardens :—

Director - - -	J. F. Bailey.

Acclimatisation Society's Gardens :—

Secretary - - -	H. J. Johnson.
Overseer - - -	James Mitchell.

Forest Department :—

Director - - -	*Philip MacMahon.

Cairns.—Kamerunga State Nursery :—

Manager - - -	Howard Newport.
Overseer - - -	J. G. Malcolm.

Rockhampton - Superintendent - - - R. Simmons.

South Australia.—Botanic Gardens :—

Adelaide - -	Director - - -	Maurice Holtze, Ph.D., F.L.S.
Port Darwin -	Curator - - -	Nicholas Holtze.

Woods and Forests :—

Conservator - -	Walter Gill, F.L.S.

Tasmania.—

Hobart Town	-	Government Botanist	Leonard Rodway.
		Chief Forests Officer	- J. C. Penny.
		Botanic Gardens :—	
		Director - - -	Alex. Morton.

Victoria.—Botanic Gardens :—

Melbourne	-	Director - - -	W. R. Guilfoyle.
		National Herbarium :—	
		Government Botanist	- A. J. Ewart, D.Sc., Ph.D., F.L.S.
		Acting Conservator of Forests	- A. W. Crooke.

BERMUDA.

Botanic Station :—

Superintendent - - - -	*Thomas J. Harris.

BRITISH HONDURAS.

Botanic Station :—

Curator - - - - - -	Eugene Campbell.

CANADA.

Ottawa	- -	Dominion Botanist	- Prof. John Macoun, M.A., F.R.S.C.
		Assistant „	- Jas. M. Macoun.
		Director of Government Experimental Farms.	Prof. Wm. Saunders, C. M. G., LL.D., F.R.S.C., F.L.S.
		Director's Assistant and Superintendent of Botanic Garden.	W. T. Macoun.
		Botanist and Entomologist.	James Fletcher, F.R.S.C., F.L.S.
Montreal	-	Professor of Botany, McGill University.	Prof. D. P. Penhallow B.Sc., F.R.S.C.

CEYLON.

Peradeniya.—Royal Botanic Gardens :—

Director - - - - - -	†John C. Willis, Sc.D., F.L.S.
Assistant Director - - - -	R. H. Lock, M.A.
Government Mycologist - - -	†T. Petch, B.A., B.Sc.
Scientific Assistant - - - -	A. M. Smith, B.A.
Superintendent, Experiment Station	——
Curator - - - - - -	*Hugh F. Macmillan, F.L.S.
Superintendent of School Gardens -	C. Drieberg, B.A.
Hakgala - - Curator - - -	J. K. Nock.
Heneratgoda - Conductor - -	H. W. Perera.

Maha-iluppalama.—Experiment Station :—

Superintendent - -	C. J. C. Mee, F.L.S.
Nuwara Eliya - Conductor - -	D. Michael.
Conservator of Forests - - -	T. J. Campbell.

CYPRUS.

Principal Forest Officer - -	A. K. Bovill.
Director of Agriculture - -	D. Saracomenos.

FALKLAND ISLANDS.

Government House Garden :—

Head Gardener - - - - -	*Albert Linney.

FIJI.

Superintendent of Agriculture - -	Charles H. Knowles.

Botanic Station :—

Curator - - - - - -	*Daniel Yeoward.

HONG KONG.

Botanic and Afforestation Department :—

Superintendent - - - -	*S. T. Dunn, B.A., F.L.S.
Assistant Superintendent - - -	*W. J. Tutcher, F.L.S.

MALTA.

Argotti Botanic Garden :—

Director	- - - - - -	Dr. Francesco Debono.

MAURITIUS.

Pamplemousses.—Department of Forests and Botanic Gardens :—

Director	- - - - - -	Paul Koenig.
1st Assistant	- - - - - -	S. E. Pougnet.
2nd „	- - - - - -	F. Bijoux.
Reduit - -	Overseer - - -	W. A. Kennedy.
Forest Officer	- - - - -	F. Gleadow.

NEW ZEALAND.

Wellington.—Department of Agriculture :—

Biologist	- - - -	T. W. Kirk.

State Forest Department :—

Chief Forester	- - -	Henry John Matthews.

Colonial Botanic Garden :—

Head Gardener	- - -	——
Dunedin - -	Superintendent -	- *D. Tannock.
Napier - -	„ -	- W. Barton.
Invercargill -	Head Gardener -	- ——
Auckland -	Ranger - -	- William Goldie.
Christchurch -	Head Gardener -	- *Ambrose Taylor.

SEYCHELLES.

Botanic Station :—

Curator	- - - - - -	R. Dupont.

STRAITS SETTLEMENTS.

Straits Settlements.—Botanic Gardens :—

Singapore -	Director - - -	†H. N. Ridley, M.A., F.R.S., F.L.S.
	Assistant Superintendent.	*R. Derry.
Penang - -	Superintendent -	- *Walter Fox.

Federated Malay States.—Forest Department :—

Conservator - -	A. M. Burn-Murdoch.

Kuala Lumpur.—Agricultural Department :—

Director of Agriculture.	J. B. Carruthers, F.L.S.
Mycologist - -	†W. J. Gallagher.

Experimental Plantations :—

Superintendent -	*T. W. Main.

Perak (Taiping).—Government Gardens and Plantations :—

Superintendent - -	*J. W. Campbell.

WEST INDIES.

Imperial Department of Agriculture :—

Barbados - -	Commissioner - -	Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S.
	Scientific Assistant -	Walter Biffen, B.Sc.
	Mycologist and Agricultural Lecturer.	†F. A. Stockdale, B.A., F.L.S.

Antigua.—Botanic Station :—

Curator - - -	*T. Jackson.
Agricultural Assistant	J. H. Roden.

Barbados.—Botanic Station :—

Superintendent -	John R. Bovell, I.S.O., F.L.S., F.C.S.
Agricultural Assistant	J. S. Dash.

Dominica.—Botanic Station :—

Curator - -	*Joseph Jones.

Agricultural School :—

Officer in Charge -	*Archibald Brooks.

Grenada.—Botanic Garden :—

Agricultural Superintendent.	R. D. Anstead, B.A.
Agricultural Instructor	G. F. Branch.

Montserrat.—Botanic Station :—

Curator - - -	*W. Robson.

St. Kitts-Nevis.—Botanic Station :—

Agricultural Superintendent.	F. R. Shepherd.
Agricultural Instructor	J. O. Maloney.

St. Lucia.—Botanic Station :—

	Agricultural Superintendent.	*John Chisnall Moore.
	Agricultural Instructor	T. B. Worm.

St. Vincent.—Botanic Station :—

	Curator - - -	*W. N. Sands.
	Agricultural School :—	
	Officer in Charge -	*W. H. Patterson.

Virgin Islands.—

	Agricultural Instructor.	*W. C. Fishlock.

Bahamas.—Botanic Station :—

	Curator - - -	W. M. Cunningham.

British Guiana.—Botanic Gardens :—

Georgetown -	Superintendent - -	A. W. Bartlett, B.A., B.Sc., F.L.S.
	Head Gardener -	†John F. Waby, F.L.S.
	Assistant Gardener -	——
	Agricultural Assistant	*Robert Ward.
Berbice - -	Keeper - - -	J. Nardamoonie.

Jamaica.—Department of Agriculture :—

	Director - - -	H. H. Cousins, M.A., F.C.S.
	Travelling Instructor	*William Cradwick.
	,, ,,	James Briscoe.
Hope Gardens and Experiment Station, Hill Gardens, and Castleton Gardens.	Superintendent	*William Harris, F.L.S.
Castleton Gardens	Assistant Superintendent.	John Campbell.
Kingston Parade Garden.	Superintendent - -	James Briscoe.
King's House Garden.	,, - -	*William J. Thompson.

Tobago.—Botanic Station :—

Curator - - - -	*Henry Millen.
Agricultural Instructor - -	N. Lord.

Trinidad.—Botanic and Agricultural Department :—

Superintendent -	——
Assistant Superintendent.	*F. Evans.
Agricultural Instructor.	——
„ „	H. A. Nurse.
Curator, Government House Gardens.	——
Forest Officer - - - - -	C. S. Rogers.

INDIA.

Botanical Survey of India :—

Director - - - - -	Capt. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.

Officers associated with Survey :—

Capt. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.	Superintendent, Royal Botanic Garden, Calcutta.
†W. Burns, B.Sc. - - - -	Economic Botanist, Bombay.
†C. A. Barber, M.A., F.L.S. - -	Government Botanist, Madras.
†H. M. Leake, M.A., F.L.S. - -	Economic Botanist, United Provinces.

Departments of Agriculture, Botanical Officers attached to :—

Imperial Agricultural Research Institute, Pusa, Bengal :—

Mycologist - - - -	†E. J. Butler, M.B., F.L.S.
Supernumerary Mycologist -	†W. McRae, M.A., B.Sc.
Economic Botanist - -	A. Howard, M.A., F.L.S.
Supernumerary Botanist -	†E. Holmes Smith.

Bengal Agricultural Department, Calcutta :—

Economic Botanist - -	E. J. Woodhouse, B.Sc.

Bombay Agricultural College, Poona :—

Economic Botanist - -	†W. Burns, B.Sc.

Central Provinces Agricultural Department, Nagpur :—

Economic Botanist - -	†R. J. D. Graham, M.A., B.Sc.

Departments of Agriculture, Botanical Officers attached to—*continued.*

Madras Agricultural Department :—

Government Botanist	- †C. A. Barber, M.A., F.L.S.

Punjab Agricultural Department, Lyallpur :—

Economic Botanist -	- †D. Milne, B.Sc.

Agricultural College, Cawnpur, United Provinces :—

Economic Botanist -	- †H. M. Leake, M.A., F.L.S.

Department of Economic Products :—

Reporter on Economic Products to the Government of India.	*I. H. Burkill, M.A., F.L.S., Superintendent, Industrial Section, Indian Museum, Calcutta.

BENGAL.

Calcutta.—Royal Botanic Garden, Sibpur :—

Superintendent - - - -	Capt. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator of Herbarium - -	- †W. W. Smith, M.A.
Curator of Garden - -	- *G. T. Lane.
Assistant Curator - - -	- *R. Badgery.
Probationer - - - -	- *F. H. Butcher.

Gardens in Culcutta :—

Assistant Curator - - -	- *J. T. Johnson.

Agri-Horticultural Society of India :—

Secretary - - - -	- F. Abbott.
Superintendent - - -	- *J. H. Stephen.

Darjeeling.—Lloyd Botanic Garden :—

Superintendent - - -	- Capt. A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator - - - -	- *G. H. Cave.

Cinchona Department.—

Superintendent of Cinchona Cultivation and Government Quinologist.	Capt. A. T. Gage I.M.S., M.A., M.B., B.Sc., F.L.S.

Cinchona Department—*continued.*

Mungpoo Plantation :—

Assistant Superintendent - -	*R. Pantling.
1st Assistant - - - - -	*W. A. Kennedy.
2nd „ - - - - -	*P. T. Russell.

Munsong Plantation :—

Assistant Superintendent - -	*J. Parkes.
1st Assistant - - - - -	*H. F. Green.

BOMBAY.

Bombay City.—Municipal Garden :—

Superintendent - - - -	C. D. Mahaluxmivala.

Ghorpuri.—Botanic Garden :—

Superintendent - - - -	P. G. Kanetkar.

Poona.—Government Gardens :—

Superintendent - - - - -	*E. Little.

CENTRAL PROVINCES.

Nagpur.—Public Gardens :—

Superintendent - - - -	*J. E. Leslie.

MADRAS.

Madras City.—Agri-Horticultural Society :—

Hon. Secretary - - - -	L. E. Kirwan.
Superintendent - - - -	——

Ootacamund.—Government Gardens and Parks :—

Curator - - - - -	*R. L. Proudlock.

Cinchona Department.—

Director of Cinchona Plantations -	W. M. Standen.
Superintendent, Dodabetta Planta- tion.	H. V. Ryan.
Superintendent, Nedivattam and Hooker Plantations.	E. Collins.

PUNJAB.

Delhi.—Historic and other Gardens :—

Superintendent - - - -	*R. H. Locke.

Lahore.—Government Gardens :—
Superintendent - - - - *W. R. Mustoe.

Agri-Horticultural Gardens :—
Superintendent - - - - *W. R. Brown.

Simla.—Vice-regal Estate Gardens :—
Superintendent - - - - *Ernest Long.

UNITED PROVINCES OF AGRA AND OUDH.

Agra.—Taj and other Gardens :—
Superintendent - - - - *A. E. P. Griessen.

Allahabad.—Government Gardens :—
Superintendent - - - - *Norman Gill, F.L.S.

Cawnpur.—Memorial and other Gardens :—
Superintendent - - - - *E. G. Stroud.

Fyzabad.—Fyzabad Park and Gardens :—
Superintendent - - - - *A. E. Brown.

Lucknow.—Horticultural Gardens :—
Superintendent - - - - *H. J. Davies.
Probationer - - - - *W. Head.

Saharanpur.—Government Botanic Gardens :—
Superintendent - - - - *A. C. Hartless.

NATIVE STATES.

Mysore (Bangalore) :—
Superintendent - - - - *G. H. Krumbiegel.

Baroda :—
Superintendent - - - - *B. Cavanagh.

Travancore (Trivandrum) :—
Director - - - - - Major F. W. Dawson.

Udaipur :—
Superintendent - - - - T. H. Storey.